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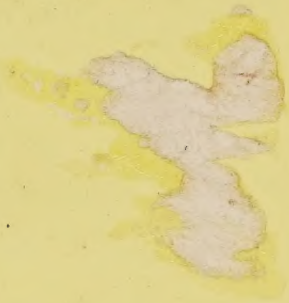

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PEEPS INTO THE HUMAN HIVE.

VOL. I.

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PEEPS INTO THE HUMAN HIVE.

By ANDREW WYNTER, M.D., M.R.C.P.,

AUTHOR OF "CURIOSITIES OF CIVILIZATION," BEING ESSAYS COLLECTED FROM THE QUARTERLY AND EDINBURGH REVIEWS; "OUR SOCIAL BEES;" "CURIOSITIES OF TOIL;" ETC.

IN TWO VOLUMES.

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TO THE READER.

THE following Essays have appeared in the *Quarterly* and *Edinburgh Reviews*, the *Times*, *Graphic*, &c. If the subjects appear to be very miscellaneous, the writer trusts the reader will permit him to say with Autolycus, that he is "a snapper up of unconsidered trifles," which he trusts he has converted into matter not wholly unworthy of attention.

THE AUTHOR.

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PEEPS INTO THE HUMAN HIVE.

NON-RESTRAINT IN THE TREATMENT OF THE INSANE.

The tomb of St. Dympna, the patron-saint of the remarkable lunatic colony at Gheel in Belgium, is sought to this day by the faithful, who have worn away for ages the stones surrounding her effigy in their prayers for her propitiatory influence on behalf of their afflicted friends. And on that spot, at least, it may be said that her influence has not been unfelt. But throughout Europe and for many ages, the treatment of the insane was based on the old priestly conception that madness meant possession by the devil. The awful visitations which darken and overthrow the mind of man were regarded as visible manifestations of the Evil One, to be exorcised by charms or averted by the ritual of superstition. Physical as well as spiritual influences were, however, not forgotten, and the priestly leeches, whilst they inculcated an appeal to the Most High in aid of their efforts to evict the arch-fiend, did not neglect to employ the devil's own

weapons in the form of brutal treatment. But it was left for later times to invent so-called scientific contrivances to wrench madness out of suffering humanity, and especially to German subtilty and imagination to devise methods of torture which transcended any amount of simple physical brutality. Instead of eviction by the aid of God, terror and surprise were called into play. Devices of so devilish a nature were sometimes employed, that we are left to doubt whether the physician or the patients were the most insane. One of these was to entice the sufferers to walk across a floor, that suddenly gave way and dropped them into a bath of surprise, in which they were half drowned and half frightened to death. A still more demoniacal plan of treatment was sometimes employed. Patients were confined by chains in a well, and the water was gradually made to ascend, thus exposing the poor victims to what appeared to them the gradual approach of inevitable death. But such terror was not sufficiently imaginative or romantic, Dr. Conolly tells us, to satisfy some German physicians, who "wished for machinery by which a patient just arrived at an asylum, and after being drawn with frightful clangour over a metal bridge across a moat, could be suddenly raised to the top of a tower, and as suddenly lowered into a dark and subterranean cavern; and they owned that if the patient could be made to alight among snakes and serpents it would be still better." In England, as late as the middle of the last century, the national tendency favoured mechanical contrivances less mentally terrify-

ing, but even more physically cruel. A Dr. Darwin invented the circular swing, in which monomaniacal and melancholic patients were bound in the longitudinal position when it was required to induce sleep, and in the erect position when intestinal action was required. This instrument was said to produce such results that the mere mention of its name was enough to induce terror. Dr. Cox, a physician, desired to improve upon this swing by advising that it should be used in the dark in hopeless cases, with the addition of unusual noises and smells. Yet this terrible contrivance was regarded by physicians of, we presume, ordinary humanity with such approval that it is spoken of by Dr. Hallaran as an invention "that no well-regulated asylum should be without." A curious example this of the complacency of even educated men in accepting arrangements, however cruel, with which they are familiar, and a warning to asylum physicians of this age to beware of what Bacon calls the "Idols of the den."

We confess that it is painful and perhaps unnecessary to trace back so far the misery the insane have undergone; and we should not have continued the sad story, were it not advisable to show that the judicious treatment of the insane is a progressive science nobly developed by our fathers and contemporaries, but yet capable of a still wider extension by our sons, labouring in a season when the fair humanities give promise of sweeping away like a flood all the old ideas which in a modified form still surround asylum life.

The evidence given by witnesses before committees of the House of Commons in 1815, relative to the condition of the old York Asylum and of Bethlehem Hospital, show that within the memory of living men patients were treated more like furious beasts than human beings. In the latter asylum they were shown to the public on certain days of the week, the charge being only twopence, a less sum than it cost to see the lions in the Tower. It was the custom for the blackguards of the town, and even for women, to jeer and mimic the demented inmates in order to excite them to rage. Refractory patients were heavily chained, sometimes those who were not violent were fastened like savage dogs to the wall. Mr. Wakefield, reporting his visit, said:—

"Attended by the steward of the hospital, and likewise by a female keeper, we proceeded to visit the women's galleries. One of the side-rooms contained about ten patients, each chained by one arm or leg to the wall, the chain allowing them only to stand up by the bench or form fixed to the wall, or to sit down to it. The nakedness of each patient was covered by a blanket-gown, only the blanket-gown was a blanket formed something like a dressing-gown, with nothing to fasten it in front; this constitutes the whole covering; the feet were even naked."

In another part of the house many women were found locked up in cells, naked and chained, on straw, with only one blanket for a covering; but this being the common treatment at the time, did not seem to strike the public mind so much as the case of William Norris, whose figure may be said to stand out as a martyr and a liberator, for the atrocious treatment of this poor

creature not only roused the indignation of the whole British community, but was instanced as a terrible example of our treatment by foreign physicians—very unfairly, by the way, inasmuch as the Retreat at York, instituted and supported by the Quakers, which exercised less restraint than any other asylum in Europe, had been in operation long previous. Bethlehem, however, being the most noted public asylum in the metropolis, naturally attracted more attention than any other. Norris, it appears, was at times violent, no doubt in consequence of the indignities he had to put up with from his drunken keeper. In order to control him, it was suggested by the apothecary that he should be chained, and that the chain should be passed through a hole in the wall of his cell, so that when it was necessary to approach him, he might be hauled up by the chain. Luckily, want of room would not permit of the acceptance by the governors of this wild-beast treatment, and a more economical cage as regards space was contrived for him, which is thus described by the French Asylum physician, Esquirol :—

"A short iron ring was riveted round his neck, from which a short chain passed to a ring made to pass upwards and downwards on an upright massive bar more than six feet high, inserted into the wall. Round his body a strong iron bar about two inches wide was riveted; on each side of the bar was a circular projection, which, being fastened to and enclosing each of his arms, pressed them close to his side."

Thus manacled he lived for nine years. It is noteworthy, as showing the dangerous influence of an

asylum atmosphere, that the Committee of Governors of the hospital, in their report upon the evidence given concerning this infernal contrivance, state that "it appears to have been upon the whole *rather a merciful and humane than a rigorous and severe imprisonment!*" and as a proof that it was so, they affirm "that he never complained of its having given him pressure or pain!"

Dr. Munro, the chief physician, who gave his assent to the use of this cruel cage, and under whose care the poor women were chained to the walls in the different wards, stated before the Committee that "irons were only fit for paupers; that they were never used for his own private patients." . . . Being asked why a gentleman would not like irons, his reply was indicative of a social contempt of the lower classes which seems strange enough at the present day, especially after the loving tenderness of Conolly for the poor and neglected. "In the first place," replied he, "I am not at all accustomed to gentlemen in irons; I never saw anything of the kind; it is a thing so totally abhorrent to my feelings, that I never considered it necessary to put a gentleman in irons." But the highest rank did not exempt the unhappy victims of mental disease from treatment at which humanity recoils. Mr. Massey, in his "History of King George III." has drawn from the Harcourt Papers an affecting picture of the atrocious treatment to which the King was subjected in 1788, when Dr. Warren regarded him as a confirmed lunatic. The King's disorder manifested

itself principally in unceasing talk (he talked once for nineteen hours without intermission), but no disposition to violence was exhibited. Yet he was subjected constantly to the severe restraint of the strait-waistcoat; he was secluded from the Queen and his family, and denied the use of a knife and fork. He was abandoned to the care of low mercenaries, one of whom—a German page named Ernst—actually struck him. The King, after his recovery, retained a lively recollection of these outrages. No sooner was Dr. Willis called in than all this changed. That estimable person immediately soothed his patient, released him from coercive restraint, presented him with a razor to shave himself, and when the King demanded a knife and fork he courteously assented, saying, that he hoped to be allowed to have the honour of dining with his Majesty. The Queen and Princesses were again brought into his presence. These measures were viewed with the greatest jealousy and alarm by the Court physicians, but the consequence was that the King in a few weeks entirely recovered. That was one of the first and most striking instances of a victory gained by non-restraint over madness.

The effect of the parliamentary inquiry of 1815 was exceedingly great. It struck the first great blow at the bad experience which is the bane of lunatic establishments. The periodical vomitings and purgings which at stated times were indiscriminately administered to the patients regardless of necessity, but because Dr. Munro had inherited the practice from his

father, were given up; poor Norris was extracted from his iron cage, and after having been so long confined in it, to the prone or erect position, thankful for small mercies, expressed his thanks that he was "allowed to sit down on the edge of his bed." The poor women that hung from their fetters and chains on the wall, like vermin chained to a barn door, were liberated, dressed like human creatures, and became at once calmer, and Dr. Haslam the apothecary, who was the medical despot of the hospital notwithstanding his proud boast to the Committee, "I am so much regulated by my own experience that I have not been disposed to listen to those who have had less experience than myself" (a remark we sometimes still hear, by the way, from asylum superintendents), found that the fresh breath of a humane public opinion had blown to the winds his cruel conceit, and so changed the den that he had "hung with curses dark," that visitors, horrified but a year before by the sights and sounds in the asylum, now scarcely recognised it, so changed and quiet were the wards.

In all public asylums and wherever any public supervision penetrated, chains were abolished, and to this extent the poor insane pauper was put upon a par with the gentleman; but handcuffs and strait-waistcoats were still considered implements that "no well-regulated asylum should be without." The time was at hand, however, in which the force of public opinion, even in respect to these minor forms of personal restraint, was about to influence old ideas. In 1803

an article on Pinel's "Aliénation Mentale," written by Dr. Henry Reeve, who was afterwards physician to the Norfolk and Norwich Bethlehem Hospital, where he introduced a milder form of treatment, appeared; and a spirited review by Sydney Smith of Tuke's work on Non-Restraint, published in 1814, contributed to enlarge the notions of resident physicians of asylums with respect to this great principle which before long was to receive a larger practical development at their hands. Still it was accident again that gave the next impulse to the movement, and this took place in the Lincoln Asylum. Conolly, in his "Treatment of the Insane," tells us that, "a patient in that asylum had died in the year 1829, in consequence of being strapped to a bed in a strait-waistcoat during the night, and this accident led to the establishment of an important rule that whenever restraints were used in the night, an attendant should continue in the room; a rule which had the desired effect of much diminishing the supposed frequency of such restraints being necessary." It was soon found that a principle that answered so well at night was also applicable by day, and the consequence was, that by degrees the necessity for restraint became less frequent, so much so, that for some successive days the asylum records were without any entry of their use. This was in the year 1834, at which time Mr. Hadwin was the house-surgeon of the asylum. In 1835, Mr. Gardner Hill succeeded him. Imbued with the spirit of his predecessor, he still further ignored the use of

mechanical restraint, and in 1837 he boldly declared that they might be altogether abolished.

As the name of Dr. Charlesworth, the visiting-physician to the Lincoln Asylum, has been associated with that of Dr. Gardner Hill as an equal labourer in carrying out the new idea—nay, has been placed by some as the real discoverer—we think it but fair that the evidence furnished by Dr. Gardner Hill in his volume, "Lunacy, Past and Present," should be adduced, and we hold it to be conclusive. Whilst it must be admitted that Dr. Charlesworth readily received the ideas of the house-surgeon of the Lincoln Asylum, and warmly seconded him in his bold attempt to throw away all implements of restraint, it cannot be further maintained that he had any right to the name of inventor of the system. Dr. Conolly, indeed, refers to him as sharing with Dr. Gardner Hill that credit, but this must be ascribed to a too partial friendship. Dr. Gardner Hill is certainly not persuasive in his style, and for this reason has raised up many enemies to his assertions; but truth compels us to say that the following evidence of his claims to the great honour of being the first to do away with mechanical methods of restraint is indisputable. The report of the Lincoln Asylum for 1836 refers thus early in the history of the great experiment to the success of Dr. Gardner Hill's fruitful idea:—"Three successive months (except one day) have now elapsed without the occurrence of a single instance of restraint in this establishment; and

out of thirty-six weeks that the house-surgeon has held his present situation, twenty-five whole weeks, excepting two days, have been passed without any recourse to such means, and even without an instance of confinement to a separate room." Again, in the report of 1838, which is signed by the Chairman of the Visiting Committee, E. P. Charlesworth, the merit of the new idea is unequivocally ascribed to the house-surgeon—no mention being made of Dr. Charlesworth's name. "There is now," says this report, "an increased confidence that the anticipations of the last year may be fulfilled, and that an example may be offered of a public asylum, in which undivided personal attention towards the patients shall be altogether substituted for the use of instruments of restraint." "*The bold conception* of pushing the mitigation of restraint, of actually and formally abolishing the practice mentioned in the last report, due to Mr. Hill, the house-surgeon, seems to be justified by the following abstract of a statistical table, showing the rapid advancement of the abatement of restraint in this asylum under an improved construction of the building, night-watching, and attentive supervision." The table thus mentioned shows that the number of hours passed by patients under restraint diminished from 20,423 in 1829 to a significant 0 in the year 1838. Although Dr. Charlesworth heartily seconded his endeavours, and for so doing deserves great praise, yet it was not to be supposed that so mighty a reform could be effected with-

out the opposition of the usual number of obstructives to all original ideas. Dr. Hill says :—

"Within the walls I had the whole staff of attendants against me. I prevailed over the attendants by going amongst them and personally superintending the refractory patients. I spent several hours daily in the disorderly patients' wards for weeks in succession—in fact I watched the attendants and the patients until I felt satisfied that restraint was a pretext for idleness, and nothing more. When restraint was abolished, then ceased the reign of 'guttling, guzzling, and getting drunk by the attendants,' as had been the case under former management. Outside the asylum I had the whole medical world against me. The superintendents of several of our largest asylums opened a regular battery against me. I was assailed right and left. The 'Hillite system,' as they pleased to term it, was denounced as 'Utopian.' By one it was called 'an absurd dogma,' by another 'a gross and palpable absurdity;' some fulminated against it as 'the wild scheme of a philanthropic visionary, unscientific, and impossible;' by others as the ravings of a theoretic philosopher, involving the unnecessary exposure of the lives of the attendants—in fact, *a practical breaking of the Sixth Commandment.* Others, more moderate in their views, denounced it as speculative, peculative, &c., &c. Dr. Clutterbuck rhetorically condemned it 'empirical, and highly dangerous to the patient and to those around him.' Dr. James Johnston said 'it indicated insanity on the part of its supporters; it was a mania which, like others, would have its day;' and Monsieur Moreau de Tours said that 'the idea was entirely Britannic; that it was *an impossibility in most cases*, an illusion always, and the expression itself a lie.'"

It seems very hard indeed if, after all these rough words, the medical man who called them forth should be deprived of the merit of having given occasion for them!

Thus, in the words of Dr. Conolly, the non-restraint system became established at Lincoln. It is to the infinite credit of the noble nature of the great reformer, that he never failed to admit, especially in public, that the initiative of the new system was not

due to himself. To Dr. Gardner Hill this great merit was due; to his lectures, indeed, on lunatic asylums, delivered at the Mechanics' Institution at Lincoln in 1838, Dr. Conolly owed the happy inspiration which led him to embrace the new doctrine. In order to convince himself of its truth, before he assumed the post of resident physician at Hanwell Asylum, he visited the Lincoln Asylum and witnessed its practical application.

It must strike many minds that the world has dealt unfairly in practically ignoring, as it has done, the claims of Dr. Gardner Hill. In all great discoveries it is generally the one who has translated ideas into acts that has reaped the final reward. The great Pinel, Dr. Tuke of the York Asylum, Dr. Hadwin of the Lincoln Asylum, all contributed their stone to the new idea, but it is to Hill that the undoubted claim of courageously clearing an asylum of all mechanical implements of restraint is incontestably due, and for this service the crown that is due to him should no longer be withheld. And this may be done without taking one inch from the stature of Conolly, who so modestly repudiated any claim to the idea during his life.

But to Conolly belongs a still higher crown, not merely for his courage in carrying out a beneficent conception on a large scale and on a conspicuous theatre, but for his genius in expanding it. To him, hobbles and chains, handcuffs and muffs, were but material impediments that merely confined the limbs;

to get rid of these he spent the best years of his life; but beyond these mechanical fetters he saw there were a hundred fetters to the spirit, which human sympathy, courage, and time only could remove.

Perfect as was the experiment carried out at Lincoln Asylum, the remoteness of that institution from the great centre of life, and the want of authority in its author, would no doubt have prevented its acceptance for years by the physicians of the great county asylums so long wedded to old habits. It was for some time treated as the freak of an enthusiastic mind, that would speedily go the way of all such new-fangled notions; and no doubt it would, had not an irresistible impulse been given to it by the installation of Dr. Conolly at Hanwell, where, with a noble ardour, he at once set to work to carry out in the then largest asylum in the kingdom the lesson he had learned at Lincoln.

Dr. Henry Maudsley in his sketch of the life of Conolly, in the *Journal of Mental Science*, dwells upon the feminine type of his mind:—"A character most graceful and beautiful in a woman, is no gift of fortune to a man having to meet the adverse circumstances and the pressing occasions of a tumultuous life." Now and then humanity has to thank the Creator for the seeming imperfections of his creatures. No doubt this great reformer's mind was not of the self-contained perfect type that would have satisfied Mr. Carlyle; it was, on the other hand, utterly lopsided; more womanly than the mind of a woman, it seemed to begin and end with love and sympathy; and what a

world of sympathy it requires to deal with the demented, fatuous, and idiotic, those only know who have been brought into constant contact with them. Together with Pinel, the great French psychologist, he possessed the rare gift of moral courage, or rather, shall we say, he possessed a firm belief in the power of gentle and humane feeling to conquer the most outrageous passions. Notwithstanding the tremendous responsibility both these noble men took upon themselves when they unloosed the bonds of their prisoners, they never hesitated, or doubted of the result of the step they were about to take. They were alike discouraged. "Experience," that dreadful impediment to all progressive science, shook its head doubtfully, and anticipated their discomfiture. Couthon, in 1792, after interrogating, at the request of Pinel, the inmates of the Bicêtre, whom that philanthropist proposed to reclaim, recoiled with horror from the proposal. "You may do as you please with them," said he; "but I fear you will become their victim." In the same manner Conolly's attempts were met with incredulous pity. His "want of experience" in lunatic asylums was ever quoted against him; and after the success of the system of non-restraint was proved, the superintendents of other asylums were still unbelievers. In a letter to Mr. Hunt, of Stratford, recording his success, he says:—"Our asylum is now almost daily visited by the officers of other institutions, who are curious to know what method of restraint we *do resort to*, and they can scarcely believe that we rely wholly

on constant superintendence, constant kindness, and firmness when required."

It is very curious to note the difference with which Pinel and Conolly reviewed the first results of their brave work—the dramatic detail of the Frenchman with the calm narrative style in which the physician of Hanwell describes the relief from bonds of a whole asylum full of lunatics:—

"The first experiment of Pinel was tried upon an English captain, whose history no one knew, as he had been in chains for forty years. He was thought to be the most furious among them; his keepers approached him with caution, as he had in a fit of fury killed one of them on the spot with a blow from his manacles. He was chained more rigorously than any of the others. Pinel entered his cell unattended, and calmly said to him, 'Captain, I will order your chains to be taken off, and give you liberty to walk in the court, if you will promise me to behave well and injure no one.' 'Yes, I promise you,' said the maniac; 'but you are laughing at me; you are all too much afraid of me.' 'I have six persons,' answered Pinel, 'ready to enforce my commands if necessary. Believe me then, on my word, I will give you liberty if you will put on this strait-waistcoat.' He submitted to this willingly without a word; his chains were removed and the keepers retired, leaving the door of the cell open. He raised himself many times from the seat, but fell again on it, for he had been in a sitting position so long that he had lost the use of his legs; in a quarter of an hour he succeeded in maintaining his balance, and with tottering steps he came to the door of his dark cell. His first look was at the sky, and he exclaimed enthusiastically, 'How beautiful!' During the rest of the day he was continually in motion, walking up and down the staircase and uttering exclamations of delight. In the evening he returned of his own accord to his cell, where a better bed than he had been accustomed to had been provided for him, and he slept tranquilly. During the two succeeding years which he spent in the Bicêtre, he had no return of his paroxysms, but even rendered himself useful, by exercising a kind of authority over the insane patients, whom he ruled in his own fashion. In the course of a few days Pinel released fifty-three maniacs from their chains; among them were men of all conditions and countries,—workmen, merchants, soldiers, lawyers, &c. The result was beyond his hopes; tranquillity

and harmony succeeded to tumult and disorder, and the whole discipline was marked with a regularity and kindness which had the most favourable effect on the insane themselves, rendering even the most furious more tractable."

But this humane conduct nearly cost him his life. The Paris mob did not believe in his humanity, and attributing it to some base motive, seized him one day in the streets, and would have hung him but for the interference of an old soldier of the guard, whom he had liberated from his chains!

The English physician, although quite as enthusiastic as Pinel, is still ruled by national calmness of thought, and his account of the first four months of non-restraint as experienced at Hanwell, is given in a letter to his friend, Mr. Hunt, of Stratford, in a manner so quiet and undemonstrative, that the greatness of the experiment seems lost in the simplicity of the record. Not only had he to deal with a much larger number of lunatics than Pinel—there were eight hundred at Hanwell when he made his first venture—but when he loosened their bonds he had no straitwaistcoats and other articles of restraint, like the physician of the Bicêtre, to fall back upon. What he gave was absolute freedom, as far as the use of the limbs was concerned, and had he resorted to even the slightest means of mechanical control, the enemies of the new movement, who were jealously watching him, would have declared that he had failed. Under such circumstances, the humble spirit in which he announces his triumph is very remarkable:—

"I know you will feel glad," he says, writing to his friend in January, 1840, "that we have now ruled this great house for four months without a single instance of restraint by any of the old and objectionable methods. The use of strait-waistcoats is abolished, hand-straps and leg-locks never resorted to, and the restraint-chairs have been cut up to make a floor for the carpenter's shop. All this of course occasioned some trouble and some anxiety, but the success of the plan and its visible good effect abundantly repay me. I think I feel more deeply interested in my work every day. I meet with the most constant and kind support of the magistrates; indeed, my only fear is that they should say too much of what is done here, and thus provoke envy and censure."

Looking at the matter as we now do, so long after the practical process of the abolition of all means of personal restraint has been established, we cannot fairly estimate the anxiety of mind that must have oppressed Conolly, when having thrown away the fetters he stood face to face with suicidal patients whose great aim in life is to get rid of it. The enduring cunning of this class of patients in compassing their ends, their adroitness, their impulsive vigour, but too well known to him, must have been before him night and day—a single life lost at this moment of trial, and the whole superstructure would have crumbled to the dust. It unfortunately happened that during the second year of trial nine such cases were brought to Hanwell; many of them came in a raving condition, bound hand and foot; they were taken to the wards and then set free, whilst those who brought them fled in terror. Well might the resident physician, in the presence of such crucial tests of the faith that was in him, tremble for its success. Instead of rigid bonds to confine the patient's limbs, he had nothing to resort to but un-

ceasing watchfulness and sympathy. These were to all the world but himself weak and impotent substitutes; but the event proved that he looked with larger eyes than his contemporaries, and his courage was responded to with the most complete success. The abolition of all means of personal restraint was soon found to have more than a temporary influence upon the patients. It modified the very types of insanity. Instead of calming, the patients' bonds only exasperated them, and their features from their constant employment settled into rigid expressions of rage and fury, that we are only familiar with in the prints of madhouse scenes in the old times—to wit, Hogarth's grim sketches, which seem almost to caricature human nature, even when exhibiting the most diabolical expressions. Conolly in his fifth report notices this extraordinary change:—

"Fresh illustrations have been daily afforded of the advantages of those general principles of treatment, which have been expressed in former reports, and of which the effects are to remove as far as possible all causes of irritation and excitement from the irritable, to soothe, encourage, and comfort the depressed, to repress the violent by methods which leave no ill-effects on the temper, and leave no painful recollections on their memory; and in all cases to seize every opportunity of promoting a restoration of the healthy exercise of the understanding and of the affections. Insanity thus treated undergoes great, if not unexpected, modifications; and the wards of lunatic asylums no longer illustrate the harrowing descriptions of their former state. Maniacs not exasperated by severity, and melancholy not deepened by the want of all ordinary consolation, lose the exaggerated character in which they were formerly beheld."

The history of the four months from the 1st of June to the 31st of October, 1839, the date of the first report

presented to the Quarter Sessions by the resident physician of Hanwell Asylum, repeats itself in all the subsequent reports from his pen. Implements of coercion were abolished once and for all; and if the history of non-restraint was limited to a mere record of the disuse of these mechanical implements, the record would be very slight indeed; but, as we have before said, Conolly took no such limited view of the great theme he was handling. In his mind non-restraint was synonymous with an entire absence of any circumstance or thing that unnecessarily irritated or thwarted the patient—a position asylum physicians, as a rule, have not yet fully comprehended. There are methods of coercion which wound the spirit still more than manacles hurt the body. Fully aware of the tyranny that may be inflicted without the use of iron or thong, in every page of his works he enforces the necessity for human sympathy and kindness. That the philanthropic labours of Dr. Conolly were not overlooked by his contemporaries we have proof in the following extract from the first number of the *Psychological Journal of Medicine*, written by the editor (Dr. Forbes Winslow) in the year 1848. In reviewing Dr. Conolly's work on the "Construction and Government of Asylums," Dr. Winslow thus bears honourable testimony to that physician's benevolent exertions on the behalf of the insane then under his care in the Hanwell Asylum:—

"Let the hundreds who annually visit this noble institution, and wend their way through its wards, inspect its arrangements, and

perambulate through its grounds, give evidence of the admirable skill with which everything is conducted. Dr. Conolly's spirit appears to pervade every department of the asylum; he is like a father among his children, speaking a word of comfort to one, cheering another, and exercising a kindly and humane influence over all; making the very atmosphere in which the patients live redolent of the best sympathies of our nature. He feels, as all ought to feel who undertake the important, the anxious, and responsible management of the insane, *that the affliction of disease does not necessarily block up the avenues to the human heart;* that even in the worst, the most distressing forms of mental malady, there often exist some of the better principles of our spiritual being in all their original purity, upon which the physician and the moralist may act with advantage."

In this liberal and just view of the treatment of the insane, we fear he has left but few disciples behind, few who see the whole scope of his system, or at least have courage to carry it out. Had he lived, he would not have thought that the county asylum was the latest expression of his idea, or have contented himself with that form of brick and mortar humanity which county magistrates so affect. Indeed, we have his own words in condemnation of asylum extension, at a time when it had not reached its present monstrous development. Ten years ago, in a letter addressed to Sir James Clark, whose able and interesting memoir is now under review, he says:—

"In the monstrous asylums of Hanwell and Colney Hatch, sanitary principles have been forgotten and efficient superintendence rendered impossible. The magistrates go on adding wing to wing and story to story, contrary to the opinion of the profession and to common sense, rendering the institution most unfavourable to the treatment of patients, and their management most harassing and unsatisfactory to the medical superintendent."

And this process of enlargement is going on with redoubled vigour all over the kingdom. Nearly every

county asylum is demanding and obtaining enlargement, and applicants are overtaking even these enlargements. It is capable of proof that lunacy is not increasing in a greater ratio than the population, but still they flow into these asylums quicker than the old inmates die out. The very imposing appearance of these establishments acts as an advertisement to draw patients towards them. If we make a convenient lumber-room, we all know how speedily it becomes filled up with lumber. The county asylum is the mental lumber-room of the surrounding district; friends are only too willing, in their poverty, to place away the human encumbrance of the family in a palatial building, at the county expense. But though the natural appearance of these institutions is so attractive, the pleasure-grounds look so well kept, the walks so trim, everything that is merely material is in such good order, we fear we must demur to the extravagant opinions that have been uttered with respect to their qualifications as places of mental cure. Insanity does not wholly alter a man's nature; as a rule, his old instincts, habits, and feelings remain exaggerated or twisted in some cases no doubt, but still they form an integral part of his nature, and cannot be rudely violated or oppressed without creating natural offence.

Let us enter one of these fair asylums however, which, according to Professor Paget of the Cambridge University, "is the most blessed manifestation of true civilisation that the world can present." Let us, as we have said, pass along these interminable wards and

examine this paradise which rouses the Professor to such an enthusiastic approval—enter not with heart hardened by long endurance and deadened by that dreadful experience, which kills all attempts at reform; but with a fresh mind which does not refuse the lunatic in his harmless condition at least some of the ordinary feelings and emotions of our common humanity. The first thing that strikes us is the monastic and cloisteral system which obtains. It would appear as though it were an offence in asylum life for men and women to meet together. We all know the amenities that prevail in convent life, and of the manner in which nuns love one another; how then can we wonder that the female patients we pass in the long galleries are eaten up by utter vacuity and dreariness; or that the men only a stone's throw off herd hopelessly together, starved of some of the best feelings of ordinary life such as arise from social intercourse with the other sex? It strikes one with astonishment to see the airing courts thus sorted as if especially to make the wanderers miserable. To see that even meals cannot be taken in common. We ask in vain why this unnatural division is established—a division which while it violates nature, deprives the physician of one of his best means of cure. Some years ago it was the custom of Colney Hatch for the females and males to dine in one room, but at different tables—an expedient which at the time called forth the praise of the visiting commissioners; but even this mild, not to say aggravating, approach to a more natural state of things—at a distance, has of late been

discontinued. There is no objection urged against a natural mingling of the sexes under proper precautions, and the only practical objection urged against it that we have ever heard, is that the organisation of asylums does not permit of these mixed gatherings. The decorous and regulated intercourse of the sexes is in itself an invaluable lesson in self-restraint.

Towards the end of Dr. Conolly's life, he was oppressed with many fears lest the advance that had been made should, through the selfishness and neglect of mankind, lose its impulse, and indeed be permitted to go back. The present age is certainly not less philanthropic than the one in which he carried out this great reform, but there are certain elements at work in asylum life that justify some of his apprehensions. The first and foremost of these is the gradual growth of the county asylums. Some of these have become so large that anything like individual treatment of the patients is quite out of the question. They have ceased to be houses for the cure of mental disease and have subsided substantially into mere houses of detention. And not only have they outgrown their curative capabilities, but they have also degenerated from that high standard as houses of mercy and pity, to which Conolly would have them raised. No one saw more clearly than that philanthropist the fact that the abolition of all means of mechanical restraint put the asylum physician at the mercy of his attendants. In place of the strait-waistcoat, which with all its faults acted without passion, he had to rely upon human force liable to

human weakness. To keep this in check the most careful supervision is absolutely necessary—a supervision on the part of the medical officers, that is ludicrously inadequate on account of their limited numbers: the result is that as a rule the patients are at the mercy of the attendants. What that mercy is, let the inquests that have lately been held in asylums on patients who have died through brutal ill-treatment at their hand make the sad answer. We do not wish to be hard upon these "instruments of the physician's will," as Conolly terms them; they are neither better nor worse than others in the same class of life; those only who know how trying are their duties can fairly make sufficient excuses for them; but as a fact, the school they go to is not calculated to teach humanity to uneducated minds, and we more than fear they do not forget their instruction. What we say is no mere surmise. The difficulty of obtaining trustworthy attendants is one of the trials of the medical superintendent. Yet without their intelligent aid he works in the dark.

"The physician," says Conolly, "who justly understands the non-restraint system, well knows that the attendants are the most essential instruments, that all his plans and all his care, all his personal labour, must be counteracted if he has not attendants who will observe his rules when he is not in the wards as conscientiously as when he is present."

Again, he says, significantly enough:—

"Attendants are generally persons of small education, and easily inflated by authority; they love to command rather than to persuade, and are too prone to consider their patients as poor lost creatures, whom they may drive about like sheep."

We fear the attendants of the present day are not one whit improved. There are certain asylums that have such a bad name for those trained in them, that they stand no chance of obtaining service with the medical superintendents of other establishments. Indeed, such are the tricks they learn, that many asylum physicians prefer obtaining assistants who have never seen asylum life. As the strength of any establishment must be measured by its weakest part, we fear that county asylums in this particular come off but very poorly. As we have said before, it is the attendant who is the real master of the patient: hour by hour he is at his mercy. The many small cruelties he perpetrates, sometimes from temper; the many neglects he is guilty of, often in consequence of fatigue, are seldom known and are but rarely recorded. It is only when some dreadful cruelty happens that the world is made cognisant through an inquest, that restraint has not altogether vanished with the destruction of bonds. When we hear, as we have too often of late, that a poor demented creature has had his ribs crushed in by the knees of his attendant whilst kneeling upon him, or trampling on his chest in that position, possibly the public might be induced to think twice over the verdict, that "the county asylum is the most blessed manifestation of true civilisation that the world can present." At the last spring assizes no less than three convictions have been obtained in different parts of the country against the keepers of lunatics for acts of brutality and violence. No wonder Lord Shaftesbury

expresses a hope that these verdicts may have a salutary effect in future.

At all events poor Reynolds, who died whilst experiencing one of the "manifestations of civilisation," would have been able to put in his protest against this doctrine if they had only given him a little more time to live. For these evils the county magistrates are wholly answerable. The Visiting Commissioners have over and over again protested against the enlargement of asylums, clearly seeing as they do that the whole spirit of non-restraint is thereby contraverted, but unhappily the Commissioners have no power to avert the evil. The supervising power established by the Government to correct the tendency to slip back into restraint, is set at nought by the jealousy of the county magistrates, who hold the purse-strings. With them the county asylum is mainly an institution to maintain and keep lunatics on the club system, and their cure, the only proper object of an asylum in the eyes of the physician and the legislation, is made a secondary object.

"If," says Dr. Conolly, "the public would really estimate the consequences of the present inadequate number of medical officers in relation to their duties, which at least ought to be performed in asylums, an augmentation would be insisted upon. With the various interruptions to which they are liable, it is quite evident that the medical officers cannot sufficiently superintend a thousand patients; that they cannot even sufficiently visit the wards often without exhaustion, and consequently cannot exercise due supervision over the attendants; that on numerous occasions important duties must be omitted, and important circumstances overlooked, and that many special moral appliances must be neglected with serious consequences, not the less real because they are unrecorded. Without a very

efficient superintendence, chiefly to be exercised by the medical officer, or rather by the chief medical officer, the mere absence of mechanical restraint may constitute no sufficient security against the neglect, nor even the actual ill-treatment, of insane persons in a large asylum. The medical officers who consider such watchful superintendence not properly comprised in their duties have formed a very inadequate conception of them."

The absurd rules which are forced by the magistrates on the medical superintendents take up much of the little time they have for their overwhelming daily labours. We were informed by one of these gentlemen, that by the rules of his asylum, he was obliged to make an entry of his visit every time he entered a ward; and this piece of needless clerkship alone occupied forty minutes every day. Whilst we dwell with pride upon the fact that mechanical restraint is practically abolished in this country, let us not forget that foreigners sometimes regard with astonishment the miserably inadequate staff with which we are contented to work our asylums. Colney Hatch, with its 2,000 patients, has only four medical officers,—is it to be wondered at that foreign physicians refuse to believe in our boasted moral treatment when they find our medical supervision so miserable a sham?

The patients are treated on an organised system, very well suited to a workhouse, but totally unfitted to an asylum for mental cure. Individuality is entirely overlooked; indeed the whole asylum life is the opposite of the ordinary mode of living of the working classes. When the visitor strolls along the galleries filled with listless patients, the utter absence of any object to

afford amusement or occupation strikes him most painfully. Care is taken to shut out the ever-varying scenes and passages of life, so full of variety and so fraught with interest. Every natural emotion and healthy motive that freshens the intercourse between human beings in the outside world is excluded from them; and what is substituted? It is remarked with infinite approval now and then by the Commissioners that the walls have been enlivened with some cheap paper, and a few prints have been hung in the galleries, that a fernery has been established—matters all very well in their way, but utterly inadequate to take the place of the moving sights and scenes of the outside world. Can we wonder that the chronic and convalescent patients grow weary of their prison, that the very sight of the asylum is hateful to them, that the greatest treat you can give them is a walk out of sight of its walls?

The great want admitted in every asylum is occupation. In the county asylums the labourer goes with a sense of relief to work at the farm, and the artisan takes his place in the workshops—those true places of cure when moderately used. But even these invaluable aids to medicine may, we think, be greatly improved. At present by many patients the work is looked upon as mere diversion, it lacks the stimulus that urges on a man in the world. As it is admitted that the object in setting the patient to work is not that he may repay by his labour the cost of his treatment, but that he may be induced to cast aside his hallucinations and fancies, and return once more to healthy feelings and thoughts

—why is the healthy stimulus of pay withheld? How many a man would be gradually drawn from his insanity if he knew his labour was to have its reward, and that he would leave the asylum with help for those his illness had thrown into sore poverty and distress!

The time has at length arrived when it is obvious that if our asylums are to resume the true position from which they should never have been allowed to depart—that of hospitals for the treatment of the insane—a thorough revolution must be made in their management; and in order to bring about new measures, we must pray for the advent of entirely new men. There are epochs in all institutions at which a paralysis seems to seize upon those conducting them. With regard to our present superintendents as a body, with a few noble exceptions, we unhesitatingly assert the spirit of Conolly is dead. A miserable spirit of routine, without resources, spring, or energy, is sapping and destroying asylum life. The gross fallacy of supposing that no man without experience in pauper lunatic asylums is capable of taking charge of such establishments, is the cause of an infinity of mischief. Our own belief is, that wholly fresh blood is imperatively demanded. Who have been the great reformers —the leaders in the onward, ever onward course of non-restraint? Not physicians trained in all the bad traditions of asylums, but general physicians, who have come to the task with fresh minds and habits untainted by an unhappy experience. Pinel, before he took

charge of the Bicêtre, was a general physician. Conolly, happily, was innocent of the ways of asylums before he became superintendent of Hanwell; and the far-famed Retreat at York received its inspiration from an intelligent Quaker layman, William Tuke, of York. It is the same with all other professions and arts: improvements come, as a rule, from without; from a class of thinkers, who have not to unlearn habits of mind instilled into them by a kind of Chinese practice and a reverence for old authority.

No doubt in the eyes of the public these establishments are the necessary places of detention of troops of violent madmen, too dangerous to be allowed outside the walls. It is difficult to get rid of old notions on the subject of lunatics. The popular idea is that they must all be raving and desperate, and the visitor to an asylum enters the wards with the expectation of meeting violent maniacs, whom it would be dangerous to approach. He has not taken many steps, however, before this illusion begins to vanish; he may even ask, "Where are the mad people?" as he sees nothing but groups of patients seated round the fire or lolling about in a dreary sort of way, perfectly quiet, and only curious about the curiosity of the stranger. This is the class of people that form at least 90 per cent. of the inhabitants of our asylums, chronic and incurable cases that no treatment will ever improve, upon whom the elaborate and expensive classification and organisation is entirely thrown away, and to whom the palatial character of the building in which they are immured, not only

affords no delight, but is perfectly detestable. It is this class of patients, beyond human help, that now choke up the public asylums throughout the land, converting them from houses of cure into mere prisons. It will doubtless surprise the reader to be informed that out of the total number of 24,748 pauper-patients in county and borough asylums, and in registered hospitals, in the year 1867, no less than 22,257 were past all medical cure, whilst the curable amounted only to 2,491, or a little more than 10 per cent. When we consider the pressure put upon the ratepayers for the erection of large asylums throughout the land, this result is so disastrous that it may be said our whole scheme for the cure of lunatics has utterly broken down. And the mischief is growing from day to day, for the chronic cases are eating up the miserable percentage of beds still open for newly-arrived acute cases. As the asylums are extending in size, the very atmosphere within the walls may be said to be saturated with lunacy. They are becoming centres for the condensation and aggravation of the malady, rather than places of cure; just as the crowding a fever hospital makes the type of disease more malignant. We are convinced that this is an evil that has been too much overlooked. The insane not only require more physical support than the sane to keep them from going back, but also more healthy mental stimulus; they cannot lean upon themselves without deteriorating. Hence the true principle of cure for the curable, and of support for the incurable, *is an association with healthy minds.*

It must not be supposed that the insane are altogether wanting in observation, or that they are uninfluenced by example. To drive weak and perverted minds into a crowd, and there keep them as a class apart, is clearly against the teachings of common sense, and is opposed to scientific observation; and to keep them there unnecessarily is a crime. The most painful impression left upon us after visiting a county asylum is the doleful wail from the patients as they pray for liberty from the medical attendant—all the more painful as we are aware that large numbers are needlessly detained. Of the ninety per cent. of chronic cases, at least thirty, by the admission of the medical superintendents, and probably nearly forty to less official views, are both harmless and quiet, capable of giving some little help in the world, and with a capacity for enjoyment. To deny them their liberty under these circumstances is both cruel and illegal, inasmuch as the certificate of lunacy which is the authority for a patient's detention states that he must be "a *proper* person to be detained and taken charge of," which certainly cannot be said of these poor harmless and incurable creatures.

Thus it will be seen that more than a third of the beds in existing asylums are improperly filled, and may be cleared not only with advantage to those needlessly detained, but also to the ratepayers, inasmuch as the room they take up would afford accommodation for these next twenty years for the acute and curable cases which cannot now find admission.

The advisability of opening the asylum gates to this

crowd of incurable and quiet cases being granted, as it is, by the Commissioners and the medical superintendents of asylums, the next question is how to provide for them. The Commissioners, with a pardonable official conservatism, have a pet plan of their own: they are perfectly willing, and indeed desirous of clearing the asylums of every patient that can with safety be permitted more freedom, but they cannot make up their minds to let them go beyond sight of the establishment. Thus in their twenty-first report they refer with approval to the associated cottage system which has been adopted in some of our asylums:—

"In the enlargement of existing county asylums, as well as in erection of new ones, it has been our practice to advocate, as far as possible, the construction for the more quiet and trustworthy patients, especially those employed in the farm, or in the laundry and workshop, of inexpensive associated accommodation, homely in character, and simple in architecture.

"The detached blocks erected at Kent, Devon, Chester, Prestwich, Nottingham, Glamorgan, and Wakefield asylums, and the associated accommodation provided in many others in connection with the laundry and the workshops, have proved most successful, and all our experience points to the advantage which not only the quiet working patients derive from this description of accommodation, but even some of the less orderly and tractable."

The advantage of these associated buildings for patients convalescent but still under treatment cannot be denied; they are valuable stepping-stones to the outside world to which these convalescents are tending, but as regards the crowd of harmless incurable patients, the outlay they could possibly supply would be totally inadequate to the demand. Moreover they are nothing more than the extensions of the asylum, broken frag-

ments scattered around it, and totally wanting in the freedom that is alone valuable for the mass of chronic and incurable cases. It is impossible to refer to this recommendation of the associated cottage system without recollecting that they have been inspired by a far simpler system that has lasted with approval for ages, and one which is as much superior to this weak imitation as a fine picture is to a feeble copy.

We referred at the commencement of this article to the one exception to the cruel treatment of the insane that obtained throughout Europe as late as the first quarter of the present century. Singularly enough the exception was in the land of municipal liberty—Belgium. The following account, gathered from the *Psychological Journal of Medicine*, is the substance of a report by Dr. John Webster of London, to whose discrimination, fairness, and perfect truthfulness psychological medicine, in England at least, is indebted for this rediscovery of an institution which has had an immense influence in furthering the non-restraint principle in its widest and best spirit.

"What is far more interesting to those accustomed to the bolts and bars, the locks, wards, and high walls of crowded European asylums, is the almost entire liberty accorded to the lunatics resident in the town of Gheel and its neighbouring hamlets, to the number of 1,100, or a little more than a tenth of the whole district. The only building in the nature of an asylum is a structure fitted for sixty patients in the town of Gheel itself, lately erected. Here the patients when they arrive are detained a short time on trial, before they are dispersed among the cottages under the care of the *nourriciers*, or attendants, or caretakers, under whom they subsequently remain. The little army of pauper and other patients, gathered from the whole superficies of Belgium, instead of being stowed away in gigantic asylums, such as

Colney Hatch, in which all ideas of life are merged in the iron routine of an enormous workhouse, are distributed over six hundred different dwellings, the major portion of which are small cottages or small farmhouses, in which the more violent or poorer patients are dispersed; and the remainder are situated in the town of Gheel, and are appropriated to quieter lunatics and those who are able to pay more liberally for their treatment. In these habitations the sufferers are placed under the care of the host and hostess, more than three patients never being domiciled under one roof, and generally not more than one. The lunatic shares in the usual life of the family, his occupations and employments are theirs, his little cares and occupations are the same as theirs. He goes forth to the fields to labour as in ordinary life; no stone walls perpetually imprison him, as in our asylums. If it is not thought fit for him to labour at the plough or the spade, he remains at home and takes care of the children, prunes the trees in the garden, and attends to the pottage on the fire; or, if a female, busies herself in the ordinary domestic duties of the house. The lunatics, as may be supposed, are not left to the discretionary mercies of the host and hostess. A strict system of supervision prevails, somewhat analogous to that of the lunacy commissioners and visiting justices of England. The entire country is divided into four districts, each having a head guardian and a physician, to whom are entrusted the medical care of every inmate belonging to the section. There are in addition one consulting surgeon, and one inspecting physician, resident in the infirmary at Gheel, for the whole community. The general government of the colony is vested in the hands of eight persons, who dispense a code of laws especially devised for it. The burgomaster of Gheel presides over the managing committee, whose duties are to distribute the patients among the different dwellings, watch over their treatment, and to admit or discharge them. Of late the divisional officers have the duty of selecting the *nourriciers*, who are chosen, not hap-hazard like our own, but for no other reason than the good of the patient, and they are selected for him with a view to his age, manners, language, and calling—in short, the *individual* requirements of the lunatic are especially considered. Even the style of household and family arrangements are not thought too small a matter to take into account, when the disposition of the lunatic is settled. The *nourriciers* themselves have a stimulus of the reward for their kind treatment, in the shape of a more remunerative patient, and they also have honorary rewards distributed with great ceremony for their kindness and intelligence; on the other hand, in case of any neglect, the patient is instantly removed, a punishment which is generally effectual in preventing a neglect of duty. It is said that the *nourriciers* have acquired through ages a traditional aptitude for

the intelligent treatment of patients: this may seem a strange assertion, but we see no reason why qualities of this nature may not as well be transmitted—at least, if Dr. Darwin's facts are to be depended upon—as any others."

A later writer upon this remarkable colony, Dr. Edmund Neuschler, says:—

"At the hearth and at the table, so also in the stable and the field, and at the most various occupations, the working patient is the companion of his *nourricier*. At the time of my visit, attention was universally directed to the potatoe harvest; and I saw the liveliest activity out of doors, both among sane and insane. *The constant companionship permits the most natural and unconstrained supervision of the patient.* It does not annoy him, and it is hardly to be observed, as the *nourricier* does not stand over him like an idle spectator or a keeper, but is apparently engrossed in his own work. Often indeed, if the patient is trustworthy, he goes alone to the field, or is accompanied only by a child; and it has never happened that the latter has been injured by his companion."

It cannot be expected that no restraint is used, considering that our system of non-restraint is nowhere received abroad; but it is worthy of notice, that with this free-air system of almost perfect domestic treatment, the number of persons in restraint, and that of a light kind—consisting mostly of an anklet—is less than is to be found in many of the closed asylums of France. Even these restraints—used mostly to prevent escape in a perfectly open country—are becoming milder every day, and the present chief physician, Dr. Bulkens, is in hopes of getting rid of them altogether. The remuneration to the *nourricier* is small indeed compared with the sum allowed to patients' friends in England when they are permitted to go out on trial—namely from 65 to 85 centimes daily, out of which,

besides expenses of clothing, 12 francs are annually deducted for medical attendance.

Ever since the existence of this singular community has been made known to the psychological world in England, its teaching has made the most profound impression upon it. It was not to be expected that our own superintendents of asylums, saturated with a vicious spirit of routine which they unhappily term experience, would at once acknowledge the value of a plan so antagonistic to their own interest and to our own asylum practice, which they have been led to imagine as perfection itself; but in the discussions that are continually taking place on the advisability of a further extension of the non-restraint system, Gheel is continually cropping up like a ghost that cannot be laid. Insignificant objections, futile nibblings at details, the usual outcries of small minds on the impossibility of *our* learning anything from a benighted remnant of a remote age, are heard from time to time; meanwhile, practically we are beginning to talk with approval of "the associated cottage system." But a moment's consideration shows that this plan, referred to by the Commissioners, is an inversion of the plan of the Gheel community. In the latter the hospital is a mere atom compared with the wide extent of the surrounding country, which is the real trial-ground and true fold and asylum of the patients. The asylum building is not even visible, and never throws a dismal shadow on the surrounding free ground, whilst our associated cottages are oppressed with the magnitude of the

gloomy walls that overshadow them. The patients in them, whilst allowed this slight tether, feel that the attendants under whose care they remain, bring day by day the stifling asylum atmosphere with them, and all the associations of the dreary house of detention. And if these cottages thus overshadowed are sought after, as we know they are with delight by the patients, what a light the fact throws in the direction of Gheel!

Indeed it is in this direction that nearly every eminent authority in psychological medicine is inclined to tread. "Family life" is the new watchword that is being uttered by the best teachers on Mental Pathology throughout Europe. The family life mainly surrounds the woman; she it is who is its perpetual centre—from her flow all the affections and the feelings; we can therefore fully understand the reason that in the colony of Gheel it is the housewife that mainly takes charge of the patients. Dr. Brierre de Boismont, whose eminent authority is worthy of all attention, dwells particularly upon the merit of the feminine influence in the treatment of the insane.

"The character of man," he says, "cannot bend itself to this kind of slavery. The attempt to do so is indeed most distressing, as one must listen to the same complaints, the same pains, and the same demands. These repetitions last for hours, sometimes for days. They are mingled with disagreeable remarks, irritating words, insulting reflections, and even the infliction of bodily injuries, and very often accompanied by lying slander and calumny. The character of women accommodates itself better to these incessant annoyances."

Those only who are intimate with the insane know the value of these reflections; and not only may we add

our own testimony to the value of these words, but we may also observe that the influence of children is incalculable for good. In the artless ways of the little ones there is nothing that irritates or alarms. The insane are rarely suspicious of a child's motives; they will follow their directions, join in their amusements, submit to their demands with a simple faith that is remarkable considering the fear they too commonly entertain for the motives of adults. We give our implicit belief to the statement that in Gheel a child has never been known to have been injured by any of the male patients.

Dr. Maudsley, than whom we can mention no higher name among our own psychological physicians, has wisely prophesied "that the true treatment of the insane lies in a still further increase of their liberty;" and in doing so he is but liberally carrying out the forecasts of his father-in-law, Dr. Conolly; and Dr. Lockhart Robertson, the Chancery Lunatic Visitor, has practically endorsed the same doctrine in a letter lately written to the editor of the *Lancet*, where, speaking of the benefit of placing better-class patients in the houses of medical men as private patients, he says:—"The improved treatment of the chronic insane lies in this direction—in removing them when possible from the weary imprisonment of asylum surroundings, and in placing them amid the healthier influences of home life." "Many chronic insane," writes Dr. Maudsley, "incurable and harmless, will then be allowed to spend the remaining days of their sorrowful pilgrimage in

private families, having the comforts of family life, and the *priceless blessing of the utmost freedom* that is compatible with their proper care." If this can be truly said of better-class patients, such as are to be found in private asylums, we cannot by any stretch of reasoning see why the same humane advice should not be extended to the insane pauper. The Sussex County Asylum, over which Dr. Robertson until lately so skilfully presided, admirably conducted as it is according to the present ideas of asylum management, can by no means compare with any well-conducted private asylum in the homelike character of its surroundings, or in the domestic nature of its treatment: hence we must claim him as an advocate for the domestic treatment of the pauper lunatic. We know it is asserted that middle-class life can furnish more appropriate accommodation to private patients than could the lower class for asylum patients; but we hold this to be a wholly gratuitous assumption. Does any one doubt that if a premium of twelve shillings a week were offered by advertisement for the care of harmless pauper lunatics, that adequate accommodation would not be offered in abundance? We think there can be but one answer; and yet twelve shillings is much less than the actual cost per head of asylum patients. On the average the weekly estimate is about nine shillings, but this sum excludes the original building charge or house-rent. Considering the magnificent scale on which asylums are built, and the quantity of land they stand upon, an additional five shillings per head on

this account must be added (the sum in reality is much more), yielding a present cost of (say) fourteen shillings for every pauper-patient in these establishments. Why should we persist in keeping those chronic cases against their will, and at such an expense, when, with more liberty and happiness, they may be maintained at a far less cost, and at the same time free the asylum of the beds they occupy for immediate and curable cases?

We are led by the result of these figures to consider the system adopted for pauper-patients in Scotland, the only plan that can be compared with that of Gheel. Their suitable cases are distributed among their friends and in licensed houses. The Scottish Commissioners report that this plan, which relieves the asylums of all patients that would otherwise inevitably tend thither, and removes those that would otherwise cumber the wards, works very well; and if good health is a criterion of good treatment, the Scotch pauper-lunatics so disposed of may be considered to enjoy a most unexceptional position, inasmuch as the mortality among them is lower than we find recorded among our own insane poor. Attempts have been made to depreciate this "Gheel of the North," as it has not inappropriately been termed; but we fail to find any reason for this disingenuous attempt. In 1866 there were 1,588 pauper-patients thus disposed of—75·5 per cent. with relatives and friends; 21·1 per cent. as single; and 3·4 per cent. to persons who have the Board of Lunacy licence to receive either one, two, or three patients

under one roof. This arrangement appears to be an exact copy of the Gheel arrangements. Like the Gheelois, they are under the control of the Scotch Lunacy Board, and they are visited by the Commissioners at stated times, who have the power to remove any patient to an asylum, or otherwise, as may be thought desirable. We gather from the report of Dr. Mitchell, one of the deputy inspectors, whose duty it is to visit them, the following observations :—

"They will find more to interest them in the every-day occupations of a cottage life than they could in any large establishment. What goes on there, and what they see there, comes more easily within their comprehension and interest, *and they have a pleasure in feeling that they have some little share in it all, and that personality is not lost.* Their occupations and amusements may be more commonplace than in asylums, but they are not necessarily less useful on that account. The cottage kitchen is an ever busy shifting scene, and it would not be easy to manage a tranquil pauper-patient passing from acute disease into incurable imbecility, more favourably situated than at its fireside, where the surroundings are natural, and the influences are healthy."

It would be impossible to deny this statement with truth. The picture addresses itself to any unprejudiced mind as unexaggerated and life-like. It is charged by the asylum advocates with being drawn with a *couleur-de-rose* tint, but we can see no sign of false colouring; neither is there any reason to call in question the strict veracity of Dr. Mitchell's statement. The only point in which we should feel inclined to differ from him would be his assertion that "such surroundings" are more applicable to the fatuous and idiotic, or mindless persons: all classes not dangerous

would be equally benefited by such a family system. The English Commissioners "have their reasons for doubting whether the system could adequately be extended so as to afford any material relief to the county asylums:" giving no other explanation of this reason than that 6,600 insane paupers so reside with friends in England; but this can be no bar to a further extension of the system under much better control. The country is large enough to support ten times 6,500 pauper-lunatics, if means were taken to establish such a system. No doubt sixpence a day, the Scotch allowance for such patients, is not sufficient; but, as we have before stated, twelve or fourteen shillings a week would be amply sufficient. The Commissioners, overworked as they are at present, would, we admit, be totally unable to undertake the very necessary work of supervising such a crowd of patients as would be thus accommodated; but this objection could be remedied by an increase in their numbers. They may be trebled with advantage; or, if this plan would be too costly, the work of supervision may be undertaken by the union medical officers at stated times in the year.

It has been proposed that the supervision of such cases of chronic and harmless lunatics, thus boarded out, should be entrusted to the superintendents of asylums. This plan would occupy the time of that official, which would be much better employed with the acute cases in the asylum. Very little, if any, medical care is required for those poor people who are beyond the physician's art. Moreover, the plan of

entrusting their supervision to the asylum superintendents would, we believe, be injurious in two ways. In the first place, in order to save time, there would be a tendency to lodge such boarders as near as possible to the asylum—to make a colony close to its doors; now this may very well satisfy the superintendent, who would wish to retain his dominion, and to maintain a certain kind of modified restraint upon the actions of the patients; but we contend it would be an unnecessary encroachment upon their liberty, and therefore injurious to them mentally, inasmuch as they would still feel themselves to be under the depressing influence of the prison from which they had been liberated; they would be a kind of ticket-of-leave lunatic, and would partake of the ticket-of-leave man's dreads and suspicions. Of course, where convalescent cases were thus lodged out of the asylum, as near a contiguity to it as possible would be advantageous, for the sake of the physician's constant attendance, but the chronic lunatic may very well dispense with his visits.

Supervision by a paid staff of inspectors we hold to be indispensable in such a free-air system; and we believe it to be the most practicable, and the most advantageous both for the sake of the lunatic and for the sake of the asylum itself. The visitation of private patients at present is a mere delusion, once a year being the average amount of visits paid to them. In the case of pauper boarders they would demand more careful supervision than even the better class of patients, hence a large increase of the inspectors is

indispensable. It would require time to get such a system into working order, but it would, when once established, be so elastic, that no new rules or regulations would be demanded. The office of such inspectors should not only be that of supervision, but they should also have the duty of distributing the patients. We do not think that the cottage system, pure and simple, is the best adapted to the class of patients such as are found in the neighbourhood of important cities; for instance, Colney Hatch and Hanwell, number among their inmates a large majority of town-bred lunatics. These would not necessarily be benefited by being placed in cottages in rural districts. Their habits and associations are all connected with town life. The country lunatics, again, would live more happily amid the fields, and in the midst of rural occupations among which they may take a part. Following the admirable example of Gheel, the inspector should have the power of placing out the pauper-lunatics in such houses and situations as would be best fitted for them. The peculiarities of each case should be considered as far as possible, and the person taking charge of it should be the most suitable.

There is no reason why the pauper-lunatic boarder should in this respect be treated worse than private patients in private houses. Indeed, what we ask for them is a perfectly similar free-air treatment to that granted to the quiet chronic cases among the better classes. London is full of certified patients, many of whom mix with the general population; but we never

hear of offences committed by them, neither should we if harmless pauper cases were distributed among the population.

If thirty per cent., and this we believe to be below the real number, that could with advantage be withdrawn from our asylums, were thus boarded out in private families, all the difficulties with respect to finding beds for acute cases would at once vanish, and the perplexing problem which is at the present moment troubling asylum physicians, commissioners in lunacy, visiting magistrates, and the taxpayers, would be solved. The existing establishments would present vacant wards, instead of being crowded to suffocation, and civilisation would no longer be outraged as it now is by the daily refusal to admit urgent cases. According to the last report of the Commissioners in Lunacy, just issued, no less than 661 applications for admission had been refused at Hanwell, and 562 into Colney Hatch, in less than twelve months!

But it is not sufficient to remove these chronic cases from the county asylums, we must prevent fresh ones getting in, which would speedily happen if some change were not made in the terms of their admission. Harmless cases of long standing must be made inadmissible, just as they are at St. Luke's. Unless the door is shut to cases of this kind, which are beyond hope of cure, it would be impossible to free asylums of the dead weight that would inevitably again oppress them. They may be admitted for a short time, in doubtful cases, but immediately the physician has

ascertained that they are past cure, they should at once be drafted out into private houses and keeping.

And here, we may ask, may we not take some steps to arrest the disease before it has become fully developed? It is well known that the curability of the disease depends upon its being treated early. But how is early treatment to be secured for the poor? It has struck many thoughtful minds, that one crying evil of the treatment of insanity is the fact that it is made a special science, apart from the ordinary range of general medicine. By the general practitioner it is looked upon as something out of the way of his regular duties. The family doctor has not been accustomed to consider such cases, and when brought before him, he refers them to a special authority, as something mysterious that ordinary medicine cannot touch. The approach of an attack is either unobserved, or treated simply as low spirits, or the result of indigestion; possibly the practitioner has never seen a case of mental disease, is totally unskilled in the symptoms which, to a trained mind, would have given forewarnings of an impending attack. This is a fatal blot in our medical teaching. Insanity is as much a bodily disease as gout or rheumatism. The insane action or idea as surely springs from a morbid derangement in the brain structure, as a bilious attack springs from a morbid condition of the liver. There is no mystery about it; it is a mental manifestation arising from a physical cause, and should form as necessary a branch of medical study as chest or heart disease. We believe ourselves that

this separation of one organ, and that the highest, the brain, from general medical study, is the most fruitful cause of incipient insanity being suffered to degenerate into confirmed lunacy. The sentinel who is at every man's door, be he rich or poor—the general practitioner —is the one who should be able to foresee the approach of an attack. But he has never studied, or has the slightest possible knowledge of, psychological medicine —the danger goes on from day to day, the chance of averting the evil is lost, and when the patient has become an outrageous lunatic, he is taken to a "mad doctor," that is, if he has the means to pay his fees, if not he is allowed to linger on, making his home miserable, and sinking every day into deeper disease, when he is taken to the asylum.

The loss to the community by reason of this defect in the knowledge of the general practitioner is not the only evil of this separation of psychological medicine from general medicine. The error which underlies all special study and experience, even if it makes the vision keener in a limited area, is far more serious where mental afflictions are concerned than in other diseases. A surgeon may with advantage devote himself to particular manipulative arts. A man who is drawing teeth all day makes a far better dentist than a general practitioner. The operation of lithotomy requires special skill, which practice alone can secure. But to treat mental disease properly, not only the condition of the brain, but of the whole body, must be taken into account, as in all cases madness arises from

morbid bodily conditions, some of which the specialist overlooks, or rather he is so engaged in looking for one thing, that he overlooks another which may be of equal or greater importance. Of course there will always be physicians eminent in mental disease, leading men whose genius in their own department overrides all other shortcomings, but these will necessarily be few. Otherwise we are convinced that for the good of general medicine this particular study, dealing as it does with so many complex problems, should be merged in the general routine of medical practice. If insanity were treated as a purely physical disease, like any other nervous disorder, it would lose half of the dread which at present surrounds it; it would no longer be hidden like a crime, and the patient himself would not feel the misery of being avoided and distrusted, one of the most annoying things that meet the convalescent, and often the cause of the distrust he himself evinces. Moreover, there would be no fear of positive injustice being done to the poor man, such as the decision of the late Mr. Tidd Pratt threatens to inflict upon all members of Friendly Societies who may happen to become insane. This gentleman, apparently taking the old priestly idea of insanity, that it is a spiritual disease, and therefore not within the range of usual physical maladies or infirmities for which these societies give aid in the shape of weekly sick allowances, refused to certify the rules of any society that proposed to give such aid; indeed, in more than one instance, sick allowances have been refused to members thus afflicted with the

most pauperising of all diseases. When the universities and other licensing bodies demand a knowledge of mental disease from all graduates in medicine, insanity will meet with an important check to its future progress.

But the first step towards a proper utilisation of our present system of treating mental disease in our public asylums is to disgorge them of the cases that clog their action. A fatal torpor seems at the present moment to affect all parties interested in this necessary reform. The Commissioners, the medical superintendents, the visiting magistrates, and the taxpayers, whilst admitting the evil, seem to have lost all power to make a change. Meantime, as the asylums are becoming monstrous by gradual accretion, a still more fatal obstacle to the further application of the principle of non-restraint is going on. The amount of capital sunk in the costly palaces of the insane is becoming a growing impediment. So much money sunk creates a conservatism in their builders, the county magistrates, which resists change; and moreover vested interests are growing up, which unconsciously warp the minds of the medical superintendents, as any great or radical change in the treatment of the insane would, they imagine, endanger their present position—an idea which is, of course, erroneous, inasmuch as in no case can the treatment of acute disease pass into other hands. Hence the strange and futile objections that we see daily urged against a greater freedom in the treatment of the lunatic; but that a sweeping change

in that direction is one of the inevitable reforms we feel blowing towards us in the breath of every angry discussion among practical psychologists on this matter, is but too obvious. As we see wing after wing spreading, and story after story ascending, in every asylum throughout the country, we are reminded of the overgrown monastic system, which entangled so many interests and seemed so powerful that it could defy all change, but for that very reason toppled and fell by its own weight, never to be renewed. Asylum life may not come to so sudden an end, but the longer its present unnatural and oppressive system, as regards the greater number of its inmates, is maintained, the greater will be the revolution when at last it arrives.

APPLICATIONS OF PHOTOGRAPHY.

Any real scientific discovery, however barren in practical bearing it may appear at the moment, is certain, in the long run, to lead to many other inventions, and to set in motion other appliances, which heretofore only seemed to be awaiting the new influence. The machinery, so to speak, rests idle for the want of some cog or spring to complete its action. Among the more recent examples of a latent want, the supply of which has given a start to many a new art, and has revolutionised others, may be considered Photography. The instantaneous draughtsman, ever ready, working with absolute truth both by night and day (for by the addition of highly sensitive paper the aid of the sun can now be dispensed with), catches and registers the scientific data of the astronomer and the meteorologist, seizes the wonders, and renders patent to the eye the hidden world opened up to us by the photo-microscopist; and where there is excess of light which blinds the human eye, Sol paints himself with his own beam, with lineaments so accurate from day to day, that the scientific watcher is only now beginning to discover the changes that are taking place in the great luminary.

When Fox Talbot and Daguerre simultaneously discovered the power of the pencil of light to paint an image on a tablet as quickly as it flashes upon the retina of the eye, great were the predictions of the part the new discovery would play in the field of science and art; but the wildest anticipations have already been surpassed in less than forty years since the original discovery, and every day is adding to the number of the wonders it is opening before us. It is our purpose in this paper to sketch with a light hand the many valuable arts and the curious appliances which this beautiful discovery has suggested to the scientific worker, the artist, and the manufacturer. So rapid are the changes, and so great from day to day are the improvements, that we can only treat it as a progressive art, capable of almost unlimited extension.

The most important adaptation of photography is, as might be expected, to the pictorial and printing arts. But it was very speedily discovered by Mr. Fox Talbot that beautiful as were the productions of the camera, the original photograph contained within itself the elements of its own destruction. The instability of the metallic salts of which it is composed, is only too sure, sooner or later, to lead to its gradually fading away; and many of us who possess portraits of those we fondly cherish, have experienced with regret this gradual progress of an inevitable decay. In an article by the editor of the *British Journal of Photography* in the *Popular Science Review*, the reason of this unfortunate instability in the new art is thus alluded to :—

"The blacks of photographic prints on ordinary unsized paper consist of silver. To aid in the proper fixing of a photograph, or destroying its future sensitiveness to light, hyposulphate of soda in solution is employed. The action of this salt on the silver in the pores of the paper is of an extremely complex nature, and long washing is requisite to secure its removal. If not thoroughly removed, an action continues to be exerted which ultimately results in the destruction of the picture, the blacks of which are converted into a sulphide of silver. But the sulphurous gases with which the atmosphere is impregnated, joined with the complex effects produced by the albumen (with which photographic paper is usually prepared), acting on the silver in a manner not yet clearly understood, exert a destructive influence on photography. The introduction of gold-toning has mitigated this evil to a considerable extent; but an inspection of some recent pictorial productions of photographers of reputation suffices to show that it still exists, notwithstanding the known care taken by them to obviate it."

It may easily be conceived that Mr. Fox Talbot was fully alive to this shortcoming in his great invention, and as long ago as 1852, was anxious to find some means by which permanence could be given to sun-pictures. In casting about to find some means by which engraved plates could be taken directly from the photographic negative, his attention was directed to a discovery made by Mr. Mongo Ponton a short time before, apparently by accident—that bichromate of potash became darker in colour when exposed to the light; the photogenic quality of this salt at once struck his acute mind as the means of solving the problem. After many experiments he found that bichromatised gelatine or gum upon exposure to light became insoluble in water, and that a plate could be prepared with this material, from which all those parts debarred from the light might be dissolved away. This discovery was the germ of numerous allied processes which have

revolutionised the engraver's art, and which cannot fail to have a most important effect upon the illustrations of our literature, and indeed upon pictorial art generally, inasmuch as we need no longer depend upon line engraving, woodcutting, or lithography, nature herself reproducing her own drawings at a cost infinitely less than we have hitherto paid for inferior productions of the human hand.

Among the numerous patents that have been taken out of late years for utilising by this means the sunbeam as an engraver, we name as practically established the different processes known as Autotype, Woodburytype, and Heliotype. We wish to refer to these three processes first as the only ones capable of giving, with commercial success, copies of photographs, pictures, and drawings whose delicacy of *half-tone* in a graduated tint is their chief beauty, and this cannot be produced with equal success by line engraving, lithography, or mezzotinto.

The process of relief-printing or Woodburytype, which we shall describe, as it is only known to the initiated and the trade, is a very curious art, totally unlike any method of engraving or copying previously known. As we have said before, the process is based upon the photographic qualities of the bichromate of potash, which, when mixed with a certain proportion of gelatine, dissolves away when placed in hot water in exact proportion to the amount of light that has been permitted to penetrate to it, through a glass photographic negative. Let us suppose some of this prepared

dark brown gelatine poured upon a plate of glass so as to form a film; this film being dried in a dark room, is now placed under a glass negative and exposed to light. After an exposure of an hour, the prepared film upon which the picture is invisibly copied, is placed in hot water face upwards, and then it will be seen that all the gelatine upon which the light has not acted dissolves away, and the picture comes out in relief, the elevations or raised parts being in proportion to the penetrating power of the light through the negative. This raised picture in gelatine is then dried by a gentle heat. These gelatine film pictures keep for any length of time, and may be laid by in the portfolio with impunity. Of course these films are not suitable to be printed from, as they would render impressions in masses of black and white, without gradations of colour or half-tones. The picture is now in cameo, whereas it is required to be in intaglio. In order to reverse the plate in this desired manner, when the process was first established, Mr. Woodbury thought to accomplish it by an electrotype deposit of copper. This, although a perfectly successful method, was found to be too tedious, and the method now employed is the most singular part of the process. Every boy knows that he can fire a tallow-candle through an inch deal-board; the scientific man also knows that by the process of "nature printing," as it is termed, the softest details of a leaf, even the down on the thistle, can by hydraulic pressure be impressed upon a metal plate so that it can be printed from. Our knowledge of this extraordinary

quality of a soft material to impress a harder one, may take away from the astonishment that otherwise would be felt by the statement that the gelatine mould hardened by chrome alum, when placed in an hydraulic press, in contact with a plate composed of type metal and lead, impresses a most perfect reverse of itself upon the plate. The amount of hydraulic pressure depends of course on the size of the plate, extending from 50 to 200 tons on the square inch. It might be imagined that the gelatine would be flattened by such enormous force, but this is not so; on the contrary, it will allow five or six impressions on metal to be taken without losing any of its sharpness, and as each operation does not take more than a minute, no time is lost in the operation. From these metal "jelly moulds" the object represented is printed in the following manner:—A portion of gelatine tinted usually of a dark colour, or with any permanent pigment, is placed in a liquid state in the centre of the intaglio mould of the picture, which is then placed in a press made like a shallow box with a hinged lid; a thick plate of glass at the bottom, and a similar one on the top, are perfectly adjusted so as to bring their two planes to a true level. A sheet of paper is then laid upon the mould, the lid is folded down, and the pool of gelatine ink is squeezed into the mould, the superfluity escaping over the edges of the paper. Nearly a minute is allowed to let the gelatine ink set; when this is done, the lid is raised and the picture is found fixed to the paper in relief, in fact like a jelly just turned out of a mould.

But this projection only remains for a short time, the picture as it dries shrinking flat to the paper. The lights and shades are given by the amount of colouring matter in the gelatine; where there have been high projections, of course there has been most colour entangled, representing deep shadows; where the film has been slight or in little colour, half-tones are represented; and where the pressure has squeezed away all the coloured gelatine, there are white lights. A wash of chrome alum is added to fix the image and prevent its washing off in warm water, which it would otherwise do. The delicacy of pictures rendered from the photograph is most marvellous; it would be impossible to surpass the delicacy and beauty of the half-tones, or to approach nearer to the clear softness of the photograph of which it is a perfect facsimile. Of course any colour may be given to the gelatine vehicle; the fugitive colours, however, such as the aniline dyes, are inadmissible, as they are themselves liable to fade, and thus the very object of the process would be defeated, as they would be as perishable as the photograph, which the relief process is intended to preserve.

Already some excellent specimens of its work have issued from the press, among which we may mention "Viardot's Wonders of European Art," which contains sixteen impressions by this process, with eleven woodcuts, and the contrast between the two is sufficiently striking to even the uninitiated in art. "Crossing the Stream" by Claude, gives the golden haze of the Italian distance with a delicacy which is perfectly unapproach-

able by any system of engraving, whilst the shadows possess a depth which leaves nothing to be desired. Again, the copy of Vandyck's noble portrait in the Louvre of Charles I. habited in Cavalier costume, is an exquisite example of its power to render the tenderest details and the most powerful shadows with wonderful effect. The ink used, or rather we should say the pigment, is of a very warm dark chocolate tint and of a flowing character, which gives a rich glow to all the shadows, contrasting powerfully with the harsh blacks of the woodcuts in the same volume. The small expense at which these delicate copies can be made, will, we fancy, give the process a great advantage in the illustration of books. The only drawback, as far as we can see to its being applied to cheap literature, is the necessity to mount the prints upon card, or other stiff paper, their borders being destroyed by the nature of the process, which, as we have before stated, spills all the superfluous ink over the margin, consequently trimming and mounting are necessary. Unless this difficulty is overcome, we fear the process will be confined to the more expensive class of works. At the present moment the size of the prints produced is limited by the size of the hydraulic press, which is comparatively small, but we understand this size is about to be increased.

The action of light is necessary to produce the chemical effect upon the bichromatised gelatine, but efforts are being made to accomplish this by artificial means. The company working this process have been

employing a powerful electric apparatus, worked by a gas engine, which gives a speed of 400 revolutions a minute to a revolving armature, which rotates inside a number of permanent magnets, and yields a light of great intensity. It is far, however, from being a substitute for the solar ray, inasmuch as, whilst a good impression from an ordinary negative is produced by the former in ten minutes, the electric light requires three hours to yield the same result. But this is an advance upon the lime-light, which necessitated an exposure of even double this time. In the dark winter weather, when the sun is sometimes hidden for weeks, there can be no doubt the electric light will find constant employment. In nightwork, again, it will be ready, thus affording employment upon works which otherwise would be delayed for want of daylight. Already several works have been illustrated by the Woodburytype process, and are familiar in our drawing-rooms; the pictures are easily mistaken for photographs, and are far more delicate and effective than the best steel engravings, at a cost almost nominal; a good-sized picture being reproduced at less than a farthing a copy. After a long struggle with many difficulties, this method of reproducing the most delicate drawings, photographs, &c., may be considered a commercial success, and we cannot doubt that it will have a material effect upon the engraver's art, which with some limitations, to be mentioned hereafter, it must in course of time greatly supersede.

The Autotype process, the longest established and

the best known of the different arts which have within these few years come before the public as a consequence of the want of permanency in silver prints, is the only one which can be worked by the amateur photographer, inasmuch as the whole apparatus consists of hot and cold water baths, a sheet of bichromatised and transfer paper, which may be procured from the patentees. The method of manipulation is simple enough in action, but rather too complicated to describe well, which will be the less necessary as the patentees invite the public to see the practical working of their process every Wednesday at their establishment in Rathbone Place. It will be sufficient to state that bichromate is the chemical agent in this, as in all the allied processes, by which the most literal transcripts are obtained, not only of the most delicate silver prints, but of the artist's own work, his touch, the spirit of his brush being rendered in monochrome in the most unerring manner. We need not say that however eminent the engraver may be, this literal translation is beyond his art. Indeed, the very eminence of an engraver is built upon a certain method of rendering effects which is peculiar to himself, and although his labours may be excellent as works of art, yet it interposes a mannerism between the artist and the public. The advantage of the Autotype, in common with the Woodburytype and Heliotype, is that it places the original picture at once before us, with the very method of the artist's touch, thus adding an immense charm and sense of truthfulness to the copy. Amid

the splendid gallery of autotypes to be seen in the establishment of the Company at Rathbone Place, the great works of Michael Angelo in the Sistine Chapel are the most powerful examples. We will venture to say that before these magnificent transcripts were produced, the works of this mighty master were entirely unknown to the public, and indeed, to artists themselves. The darkness of the chapel, the progress of age, and, as some say, the fumes of the incense, have so subdued the colour that even the outlines of some of the upper figures, and especially those in the spandrels of the windows, are not discernible from the floor, as most visitors to the chapel must, to their regret, have discovered. This very disadvantage has proved most favourable to the autotype copies which have been successfully taken of them in monochrome—a kind of bistre, very like the tint to which the originals are reduced by the causes we have mentioned. The artist has only to compare these precious works of art with the best line engravings of the same subject to convince him how superior they are to the latter. The grand sweep of the brush of this giant in art is placed before us, the figures seem to live as they do on the walls of the building where there is light enough for the spectator to see them. The photographic negatives from which they are reproduced were taken by the aid of the lime-light, without the aid of which it would have been impossible to copy them. Another beautiful reproduction by this process is Turner's "Liber Studiorum." These sketches were painted by

Turner in sepia, hence its reproduction was accomplished with facility, and with the exception of a little flatness in some of the drawings, it may be said to be a perfect fac-simile of this great artist's work. This great text-book for draughtsmen, hitherto a closed book to the public, may now be purchased at a reasonable cost. Another very charming work, the illustrations to Her Majesty's "Tour in the Highlands," by Adam, are rendered with a freshness and vigour the engraver could not approach.

It is needless to say that any drawing in chalk, Indian ink, or any monocrome in fact, can be matched to the exact shade. Thus the artist does not lose by the translation of his work into another tone of colour. Red chalk drawings are reproduced with admirable effect. The attempt to copy in ordinary oil-colour, however, presents certain difficulties, which have not yet been overcome, and possibly never will, until the art of producing colours by the camera on a photographic plate is accomplished. As it is, in the initial stage, the silver print copy, certain colours, as we all know, do not respond well. Thus blue and the aniline tones come out white, whilst yellow and red print black. Thus the lights and shades of a picture painted in these colours would photograph with the balance of light entirely altered. But there are many low-toned pictures which take very well. As a rule French pictures photograph admirably. A subdued tone is the fashion of the French school, and we may note that the canvas upon which those artists work, instead

of being a yellowish-white like ours, is of a pale stone-colour. This ground, we are informed, after a time shows through and gives a prevailing grey tone, which is very favourable for taking photographic copies. In the show-room of the Autotype Company there are two copies of well-known pictures—"The Arrest of Hampden when about to embark for America," by Lucy, and "The Princess Elizabeth hearing Mass," by Marcus Stone. We do not remember the balance of light in these pictures, but in the autotype copies it is admirable; but this effect has not been produced by the simple process of copying. The method is either for the artist to make an Indian-ink drawing of his picture for reproduction by this process, or if the details are too elaborate, the picture is photographed and the proof is sent to the painter, who corrects any faults as to arrangement of light caused by the photographic transfer, either with his chalk or brush, and from this corrected copy the prints are reproduced. The negatives when thrown out of balance from the reason before mentioned are retouched, and a large number of artists are employed in this kind of work. Landscapes from nature require to be corrected in the negative, and the vast number of photos from popular pictures are reproduced by what may be termed this appreciative and intelligent method of translation, which can only be effected by a certain artistic skill.

The facility the autotype process offers to artists to enable them to give the public transcripts of their works cannot be looked upon as the least advantage of

the discovery. The ordinary process of line engraving is denied to all but the highest class pictures; no one but a great capitalist will undertake such works. The expense is enormous, and the time consumed in their accomplishment renders the chance of their being finished in the lifetime of the artist very problematical. Raphael Morghen occupied six years in engraving the "Transfiguration;" Doo was twelve years at work in engraving the "Raising of Lazarus," and it was not finished when it passed out of the veteran engraver's hands. It is true we have no longer such great works as these demanding the labours of the engraver; but the genius we still have in the artistic world cannot fail to benefit by these newly discovered rapid means of reproducing their works. In a week after a picture has left the painter's easel, a proof impression is presented to him for correction.

But in a very large number of cases these corrections are not needed. We all know how many charming photographs, both of figures and landscapes, meet our eye in the shop windows. We feel quite sure that the majority of these have received no correction in the course of being printed, as they could not otherwise be sold so cheap. When we say that literal copies of all these, in almost any tone desired, can be given by the Autotype Company, and by the other processes we have mentioned, it will be seen how vast is the work they will be called upon to accomplish. The galleries of the Continent have already been reproduced by M. Braun, of Dornach, who holds the Autotype patents for France

and Belgium; and the rarest pictures of Vienna, the Louvre, and the galleries of Florence and Venice, can be procured at the establishment of the Company at a price which is merely nominal as compared with line engravings, to which in some cases they are superior. The Autotype process, as far as we can see, is the best adapted of any of the allied methods for the production of the larger works of art. From this field the Woodburytype method is excluded by the comparatively small size of the hydraulic press used, and the Heliotype method by the size of the Albion press by which its impressions are rolled off, neither of which could take the impressions as large as four feet by three, which the Autotype has just accomplished. But it must be remembered that the Autotype process is a comparatively dear method of production. Every print is accomplished by hand work, and it is not capable of reproducing with great rapidity, by mechanical means, like the other methods. For this reason it will be confined to the higher class of works, for which the comparative cost will be a minor consideration.

We have yet another process to refer to, which appears to be equally successful with the Woodburytype; and which, indeed, in the one particular of cheapness, surpasses it. We allude to Heliotype, a system somewhat similar to the Albertype, but far more speedy, the patent for which has been taken out by Messrs. Edwards and Kidd, whose works at Willesden we had the pleasure of inspecting. Mr. Ernest Edwards, whose name has long been well known in

the photographic world as the inventor of this method, has the advantage of bringing it before the public in a very high class pictorial and industrial serial, called *Art*, in which illustrations of the new process are given monthly. The beauty of some of these has attracted the artistic world, for whilst they retain all the delicacy of the photograph, they yet suggest a difference which puzzles the spectator.

From an article in the October number of that journal we quote the following particulars as to the principles and practice of the process:—

"The principle upon which Heliotype is based is analogous to that of lithography, but is much more comprehensive, and admits of results of which lithography is quite incapable. The possibility of producing a printing surface in some degree analogous to a lithographic stone, by means of photography, is based upon the well-known action of light in rendering gelatine and similar bodies, under certain circumstances, insoluble. When bichromate of potash, or a similar salt, of chromic acid, is added to gelatine, no change takes place if the mixture is kept in the dark; the gelatine retains its capacity to absorb cold water, or to be dissolved in hot. But if a layer of this chromatised gelatine be dried and subjected to the action of light, it gradually loses its capacity to absorb water, becomes finally hard, repellent of water, and insoluble. . . . . The Heliotype, as we have said, is in its method of working analogous in many respects to a lithograph. It is produced on the same principle, and in a closely similar manner, depending for its possibility on the production of a surface which will repel the adhesion of a fatty ink in every part in which it has absorbed water, and the faculty of rendering that surface absorbent of water in every part but that containing the image to be printed. But there is this noteworthy difference between lithography and Heliotype: the lithographic stone absorbs water in every part of its surface whereon an image in lithographic ink has not been previously produced; but it has no graduated capacity of absorption. The slightest touch of a fatty body, even a finger-mark, will cause the stone to repel water and take ink; where any greasy touch has been, wherever the faintest line of the image exists, it repels water completely and takes ink; where the stone is clean, and no part of

the image is, it absorbs water completely and rejects ink. The picture must therefore consist of touches of black and white, and any gradation therein must, as we have explained, depend on lines or points, and not on varying depths of colour in a continuous tint. The printing surface in the Heliotype process has an important superiority over the lithographic stone; it possesses what may be termed a discriminative power of absorption. This discriminative power in the surface is produced by the action of light upon passing through a photographic negative, the lights and shadows of which regulate the amount of light transmitted. The printing surface, after such exposure, has acquired the power to absorb water in the exact proportion in which it has been protected from the action of light; it also takes ink in the exact ratio that it has, in consequence of the action of light, acquired the power to repel water. Hence the mechanically printed image, in a fatty ink, is as true a transcript of the negative as the silver image printed by light from the same negative. Thus all the truth, and all the facility of delineation which belongs to photography, derived from nature, all the literal faithfulness and precision in rendering, not merely forms, but the spirit, expression and manner of the original, in producing works of art, which characterise photography, are preserved by Heliotype, with the superadded charm of permanency, and the advantage of a rapid and unlimited production."

The practical details of the process are as follows:—

"A plate of glass about half an inch thick, more or less, is coated with a warm solution of gelatine, to which a suitable proportion of bichromate of potash has been added, together with a little chrome alum to give it hardness. A measured proportion of this preparation is poured on the plate, so that when dry it will form a film about the thickness of a visiting card. This operation, and the drying the plate, are effected by what is technically called the dark room—a room from which all atonic light is excluded. When the film is dry, it is exposed to light under a photographic negative, the time of exposure being estimated by means of the actinometer. The next step is to place the plate in cold water, for the purpose of dissolving out all the unchanged bichromate of potash. After soaking for a short time, the image produced by the action of light on the film is seen in relief, the portion protected from light by the opaque parts of the negative, representing the whites in the picture, readily absorb water, and swell; the portion to which light has had full access, through the most transparent part of the negative, representing the blacks, have been hardened by the light and rendered insoluble and nonabsorbent,

whilst all the portions partially acted upon by light, through the graduated degrees of transparency in the negative, representing the graduations from light to dark in the image, have been rendered insoluble and nonabsorbent just in the degree to which they have been subjected to the action of light. The plate, after being thoroughly washed in cold water, to remove all the bichromate of potash, without dissolving any portion of the gelatine, is ready for printing."

The impression is printed off in an ordinary Albion press. When a print is required, the gelatine printing surface is sponged with hot water, and after the superfluous moisture is removed with the "squeegee," an Indian-rubber roller charged with lithographic ink is rolled over the surface. The ink adheres to the deep shadows, which being hard and non-absorbent refuse the water, whilst on the parts representing the gradations of tone, the ink adheres in such degree as they have rejected water, producing a perfect transcript of the original image. The advantage the Heliotype process possesses over the Woodburytype method, is that as it yields in the press clear white margins, the prints can be bound at once with type; whereas the Woodburytype pictures have smeared margins, and must be mounted, which takes time and trouble; moreover, the thick mounts make the book cockle.

Heliotypy is fitted for all kinds of work, and does not require special negatives, as the picture is not reversed in printing. The pictures can be printed in any colour, and indeed, the patentee makes a point even in ordinary prints of giving two rollings to the plate, one for the dark shadows in ordinary black ink, and another in a gelatinized ink, for the tender tones; and the effect is very good. The impressions in *Art*

by this process are very beautiful. The portraits of Vandyck and Rembrandt in recent numbers are admirable examples of its power of rendering with perfect literalness the vigour and depth of the original paintings, while the rendering of Mount St. Michael, Normandy, is a faultless specimen of rendering this grand seaview. This specimen of work we saw in the library of the printkeeper in the British Museum, and we have reason to believe that the keeper himself looks upon this specimen as a very worthy result of the new art. Heliography promises to give to literature what has been so long desired, printed transcripts of photographs at a cheap rate. The method of working and the cost of production is so small, that it bids fair to invade all the cheap forms of literature, and to reproduce for us drawings from nature, in place of inferior wood engravings and lithographs.

Let us now pay a well-deserved compliment to one department of a Government office, for not only not lagging behind, but of actually contributing a most valuable process to the arts. Sir Henry James, the Director of Ordnance and Topographical Surveys, has done the nation good service by the discovery and application of the art of photography to one of the most useful works the Government is carrying out. The reader may not probably be aware of the gigantic labour of making a picture of the United Kingdom—of mapping, with rigid accuracy, the whole surface of these islands, so that any man may put his pen's point upon his own plot of ground. This second Doomsday

Book, in picture instead of in print, was commenced on the scale of one inch to a mile in the last century, the first sheet being issued on the first day of January, 1800, and the last sheet was not completed until January, 1870. In the sixty-nine years that elapsed between these two issues, it may be imagined that the changes were enormous, especially in the neighbourhood of large towns, where the land has either been built over or largely divided. Consequently the early sheets are in many cases quite useless. Had not Sir Henry James come to our aid, the expensive process of re-engraving the steel plates would again have to be undergone. Luckily the rapid powers of photography came just in time to save the nation not only the delay, but the enormous expense of employing the graving tool. Photography is of course, as in all the other processes already described, the transferring draughtsman, and every map or picture can be reduced or enlarged at the will of the operator. In a few words it may be stated that the drawings or plans are transferred to a zinc plate covered with gelatine and bichromate of potash. All the gelatine that has been exposed to light is washed away, and the image is ready to be printed from. By this method a gigantic survey of London is just upon the eve of completion, on the scale of five feet to a mile. When we consider the size of the metropolis, it will scarcely be necessary to state that the plan as a whole will take a considerable amount of locomotion to inspect it. Not only Middlesex and Surrey, but the whole of Ireland, the towns of Scotland,

and all the cultivated ground, is completed on the same scale, and the whole country is now being gradually mapped out in like proportion. The whole of this work is carried on by the Ordnance Staff, the out-door work by the officers of the Royal Engineers and the men of the Sappers and Miners. Geological maps on a large scale have also been produced, and plans of all our great strongholds and citadels throughout the world; indeed, almost any information desired by the War Office as regards military appliances can now be furnished by this able and working department of the public service.

It was at first doubted that the reductions made by means of photography were strictly accurate, and in 1858 Sir Denham Norreys stated in Parliament that the plans so reduced were not to be depended upon. Whereupon a Committee was appointed, of which Sir Roderick Murchison was chairman, "to report upon their accuracy as compared with plans reduced by the old process, and upon the saving effected by the photographic process." The result was that "the Committee stated that the greatest deviation in any part of the plan from perfect accuracy does not amount to one four-hundredth part of an inch in the angle of the rectangle, and even this minute error is not cumulative," and that the saving already effected has been £1,615 per annum, and is now more than £2,000 a year.

Photozincography is by far the cheapest method of copying when simple black and white has to be rendered, and its applicability to the production of old

deeds and printed matter has been proved by works already accomplished. The two volumes of Doomsday Book, at one time sealed volumes to the public, are now copied with perfect accuracy, and any one may now for a small sum purchase a topographical description of his land at the time of the Conquest. Many volumes of the national manuscripts of England and Scotland, Magna Charta, the whole of the Black Letter Prayer Book of 1638, with marginal MS. additions and corrections, are also produced in absolute *fac-simile*. The wonderful help photography has rendered to the public in these reproductions is as yet scarcely known, but our unfortunate neighbours across the Channel have already severely felt its influence; for in all probability the facility with which the Prussians overran France, and the fate of many of their successful battles, were due to their marvellous topographical knowledge, which mainly depended upon the maps possessed by them of the country. Some years ago Count Moltke, having heard of Sir Henry James's process, sent over officers from Berlin to learn it, and the maps with which the Prussian soldiers have been so liberally supplied in the campaign were produced by photo-zincography. Thus in the new agent may have been one of the minor causes of the conquest of France. Nearly every country in Europe has sent agents to England to be instructed in the working of this process. It is but rarely, we fancy, that foreign powers are constrained to take a lesson from our War Office administration, but this is a notable exception. The

same process was employed with complete success by Mr. Ayling in the magnificent reproduction of the portraits of the Emperor Charles V. executed for Sir William Stirling Maxwell.

All the processes founded upon drawings from photographic negatives, although admirable for special objects, are yet wanting in the one quality necessary to fit them for the popular press. Illustrations that can be set up with type, and worked with it at the steam press, are the *desideratum*. An attempt to meet this want is made, and we hear is now sometimes employed, by taking the photographic drawing directly upon the wood; thus the more discriminative work is left to the wood engraver, who has the additional labour thrown upon him of translating the drawing with its continuous tints and shades, by means of lines, which are not marked as heretofore, but are left to his judgment and skill.

The application of photography to the microscope has at once opened up to us a whole world of wonders. By means of the lime-light, the momentary glimpses we obtain of the hidden wonders of nature are now fixed by the agency of photography, and the land of Brobdingnag is brought before us. As we turn over the pages of micro-photographs, by Mr. Higgins, it seems as if we were for the first time made acquainted with the countless living things around us. Nearly all that the unaided human eye knows of them is, that they have motion—with the larger eye of the microscope, however, it is made clear to us that the despised atoms

we brush away with disgust, possess delicacies of structure and an elaborate anatomy more complex and wonderful than those patent to the eye in the larger animals. Gulliver in his wonderland never saw the antennæ of a cockchafer as big as a lady's fan, the eye of a blow-fly as big as a cheese-plate, or the lancet and tongue of a corn-fly six inches long. It is quite clear that our intimate knowledge of entomology and of the Diatomaceæ is only just beginning, by means of these registered conquests of the pencil of light, painting with microscopic vision. We may say the same thing, indeed, of the whole invisible world of nature, as heretofore microscopic anatomy and structure could only be imperfectly rendered by the fatigued eye of the artist disabled by long gazing through a powerful lens. The skill of man has now mechanically enlarged the focus of the human eye by thousands of diameters, and with equal facility he has minified its powers and fixed its images in durable pigments upon paper. Indeed, this power of enlarging and minifying photographic images at will is likely to prove of great value to the arts and sciences. During the terrible drama lately played at Paris, we had an example in the minified messages which have enabled a carrier pigeon to convey, by the aid of microscopic photography, upwards of 35,000 messages and dispatches in the space of three inches rolled in a quill fixed to the middle feather of the tail, into the beleaguered city. We have now before us the first sheet of the *Times* so minified, containing, if we may so

speak, the drops of agony of France shed in the page, in the shape of frantic inquiries and messages to unhappy friends and relatives in the clutches of the enemy. From the pages of that journal of the 30th of January, headed, "How the *Times* was sent to Paris," we extract a paragraph full of interest, and suggestive of a system which may serve more than even the pressing purposes of the present hour:—

"Attempts to establish a rapid connexion between the beleaguered inhabitants of Paris and their relatives and friends beyond the German lines, have given rise to many controversies which are not unlikely to make a new era in the history both of aeronauts and photography. Among them may be mentioned the ingenious device by which the matter of two whole pages of the *Times* has been transmitted from London to Paris. This has been accomplished by photography. Those pages of the paper which contained communications to relatives in Paris were photographed with great care by the London Stereoscopic and Photographic Company, on pieces of thin and almost transparent paper about an inch and a half in length by an inch in width. On these impressions there could be seen by the naked eye only two legible words, 'The Times,' and six narrow brown bands, representing the six columns of the printed matter forming a page of the newspaper. Under the microscope, however, the brown spaces become legible, and every line of the newspaper is found to be distinctly copied and with the greatest clearness. These photographs were sent to Bordeaux, thence by carrier-pigeon to Paris. When received there, they were magnified by the aid of the magic lantern to a large size, and thrown upon a screen. A staff of clerks immediately transcribed the messages, and sent them off to the places indicated by the advertisers. The success of the experiment gives rise to the hope that the new art of compression will not stop here. If a page of the *Times* can be compressed into a space a little larger than that occupied by a postage stamp, the matter of an octavo volume might be made to cover not more than two of its own pages, and a library could be reduced to the dimensions of the smallest prayer-book. What a relief it would be to the learned persons who frequent the library of the British Museum, if instead of having to make fatiguing journeys from letter A to letter B of the ponderous catalogue of books, they had its many hundred volumes reduced to a

space a yard square over which a microscope could hurriedly be passed. Such suggestions are now occupying the thoughts of photographers."

Without giving any opinion as to the "relief it would be" to the readers of the British Museum to hurriedly peer out the information they require with a powerful magnifying glass, there can be no doubt that the art of photo-microscopic compression has a great field before it, and will be of great value to the sciences as well as to literature.

Scarcely a week had elapsed after the armistice was granted before the shop-windows were full of the photographic sketches of the effects of the war. The Photographic and Stereoscopic Company immediately took advantage of the interval of peace to send its artists to the neighbourhoods of the great battles, and into the midst of the besieged and destroyed towns, in order to bring home to the public the horrible proofs of the ravages of war. What a grim comment it is upon our boasted Christianity that it should be possible to give a picture of the "only house left in Bazeilles," and how strongly the terrible downfall of Napoleon and his dynasty is brought home to us by the photograph of the country cottage, with the two chairs in which the Emperor and Bismarck sat to sign the capitulation of Sedan and the downfall of the Empire. The numerous stereoscopic pictures this Company have produced of the seat of war illustrate it in a manner the last generation had no idea of. Professor Pepper, by the aid of the magic lantern, at the Polytechnic,

manages to give them lifelike size and colour, and we gaze upon the battered ruins blasted by fire thrown upon a large screen with a vivid reality that almost makes one shudder.

Astronomers have for some time past been in the habit of using photographic apparatus to delineate the heavenly bodies, and Mr. Warren de la Rue's pictures of the moon and sun are well known. The eclipses of the sun in 1867 and 1870 were taken advantage of to record the red prominences and the wonderful streamers which travel from its periphery in rays for hundreds of thousands of miles into space. The pictures of the sun so photographed show that the spots upon the luminary are hourly changing their position and shape, and the places of their outbreak. So constant are the changes in the heavenly bodies, that the human hand is not quick enough to follow them; hence the instantaneous records of the photograph ensures an accuracy hitherto unattainable. An ever-watchful sentinel, it works night and day in our national observatories, recording by constant action the movement of the mercury in both the barometer and the thermometer, and by the aid of magnets marking the flowing curves of terrestrial magnetism, which are indelibly indicated by lines on paper drums, moving by clockwork, and so arranged by regular marks that the time of any record can be fixed to the moment.

With equal impartiality photography seems to be giving its powerful aid to medicine and its allied

sciences. Dr. Sanderson, in a paper on the influence of the heart, examined by the movements of respiration, on the circulation of the blood, gives a plan of registering the rapidity and volume of the human pulse, by means of the pulse-motion, which is made to record itself by a series of zig-zag lines upon sensitised paper. This may be considered rather a curious than a useful application of photography, but it is scarcely necessary to say that its aid is of the greatest value to the physiologist, the physician, and surgeon. The numerous changes made in the aspect of wounds can find a faithful record by no other means, and the splendid collection in the possession of the Royal Medico-Chirurgical Society is a testimony to the value placed by the profession upon this method of illustrating their science.

The power of the sun's pencil in giving minute and subtle indications of expression in the human face has made it a valuable teaching power in psychological medicine. The power of words to explain certain types of insanity is feeble as compared with the whole aspect of the patient and the expression of his face—these the photograph can give with unerring certainty. Dr. Conolly illustrated a valuable series of papers on the varieties of insanity by photographs of the different types, taken by Dr. Diamond from his asylum, and as an aid to diagnosis they are truly valuable.

It has been suggested that, before it is too late, the art should be made subservient to recording the types of the various races of men that are slowly disappearing

as civilisation advances. This would be a worthy occupation for the Ethnological Society. Dr. Livingstone, we know, received instructions in the art, and we may hope that he will bring us home portraits of the strange tribes he has been made acquainted with during his long sojourn in the interior of Africa.

Dr. Forbes Watson has made us acquainted with some of the leading types of India, but how little do we know of the infinite varieties that exist in that vast country, and in Asia generally. The physical aspect of man is a subject photography alone is capable of correctly illustrating.

With respect to the influence of the evil passions upon the physiognomy, we have some record in the portraits of criminal prisoners. The governors of the criminal prisons furnish copies of these to the head station in Scotland Yard, and a villanous gallery of faces as a rule it presents. There is a photographic apparatus at the chief police station at Scotland Yard, and it was used some years since for the purpose of taking criminals, especially during the Fenian excitement, but it has not been used since; indeed, there is no legal warranty for taking a prisoner's likeness, and in more than one case where this portraiture has been attempted, it has been successfully resisted. Photographs are often a most valuable aid in discovering "persons wanted," but they are nearly always furnished by other persons to the police.

A very singular case of a thief who was "hoist with his own petard" occurred some little time since at the

West-end. A ticket-of-leave man, whose time had expired, called upon a photographer in the High Street, Kensington, and managed, whilst in the waiting-room, to pick open a desk and steal five pounds in gold and silver. He remained for some time, and on the photographer going to him to ascertain his business, he said he had an order for some card portraits, and he wished to be shown specimens, which was done. The photographer, unaware of his loss, as a reward for his trouble, expressed a wish to take his portrait, so that he might present him with several copies. The prisoner was not at all anxious to submit to the process, and it was thought that the likeness was worthless; as luck would have it, it turned out a particularly good one. The loss of the money was discovered, the photo was handed over to the police, and by its aid the thief was discovered and apprehended by an officer a few weeks after in Bunhill Row.

The law has obtained, through its instrumentality, a witness to fact which it is difficult to gainsay. There is no cross-questioning such evidence. In cases of boiler explosion and accidents to machinery, and even the damage done to vessels by collisions at sea, the silent evidence of the sun-picture is sufficient to settle many a disputed point, and not long since a lawsuit, in which Earl Spencer was one of the litigants, was decided by a photograph of a public road and a garden wall, which settled a point of disputed boundary.

But the most extraordinary piece of legal evidence we have yet heard of occurred some time since in

Australia. A gentleman named Black went with a surveyor to examine into the particulars of a certain mine claim, when he was suddenly seized by some roughs supposed to be in the pay of the other side, stripped, smeared with tar, and, for want of feathers, was ornamented with straw, wool, and other rubbish. When he managed to escape from his persecutors, instead of retiring to get rid of his horrid encumbrance, he determined to take a note of it at once, and forthwith proceeded to a photographer, where his likeness was taken in this extraordinary costume, and with this evidence upon him he proceeded to his lawyer, and laid his damages at 2,000 dollars, which he ought to have obtained, if he did not.

The War Office has taken advantage of the new agent to obtain pictures of all the modern battle-fields, and especially of the strategic positions and of the fortifications. We are rich in records of this nature, both of the Crimean war and of the Abyssinian expedition. The power of the highly sensitive paper in giving pictures of explosion is of great use to the Corps of Engineers. The height and the breadth of torpedo explosions are thus made patent to the eye, the powers of projectiles as shown by the impact of shot in armour-plates are also graphically rendered by the light-picture. It is the practice now to photograph all patterns of stores supplied to this department.

If, in conclusion, we refer to the aid photography will be to art itself, we shall not have mentioned one of its least claims upon public favour. Those

who have visited the annual exhibition of the Photographic Society in Conduit Street cannot fail to have marked the instruction the artist may obtain from these moments of nature arrested and fixed by a silver print. The grand sea-views by Colonel Stuart Wortley, in which not only the clear naked wave is painted by the pencil of light as it is rolling over, but the very drifting mist-like spray upon its crest as it dashes upon a rock. Who can estimate the value of such momentary records of details of nature to the artist,—movements that would otherwise fade from his memory? How dignified even the commonest photograph is made by the delicacy of light and shade it presents! Every head has the power of a Vandyck or a Titian. Its teaching power in this respect is undeniable. Year by year the familiarity of the public with the works of this splendid draughtsman will make the acceptance of slovenly drawing impossible. In the art of design the facilities of the sun-picture cannot fail to be appreciated and taken advantage of. Mrs. Cameron, in some of her poetical groups, and her fine examples of form, has taught us its power of fixing grace upon the canvas, and the varying forms of human expression. The same flash of light which registers the drifting foam can seize the emotion of the human soul as depicted upon the countenance. Far be it from us to say that the gifted artist should work from such reflections as these instead of going direct to Nature, but their supplementary aid cannot be undervalued. They will not take the place of the poetical eye and skilled pencil, but

they will afford excellent records of needful details and of fugitive expressions, to be stowed away for future use. The public knows nothing of the folios of sketches the artist keeps by him. These are the bricks, so to speak, out of which the finished picture is built up. Much of this work the photograph will do for him, leaving his mind free for the higher art of conception and design. And it would seem that there is good prospect of colour being added to these pictures of light, the sun's ray repeating the colour from nature. The editor of the *British Journal of Photography* asserts "that there is not the least shadow of doubt" of the fact, he "having seen, handled, and produced them." The colours, he says, are "not brilliant, but they are decided enough to be recognisable by any person not colour blind." The recipes for producing these heliochromes are given in the journal. If these confessedly imperfect colours can be rendered brighter by further study and more appropriate chemical agents, photography will indeed be a splendid art, not only for the service it renders to mankind in the different manners we have shown, but in itself, as rendering absolute transcripts of Nature in her own magnificent dress.

POSTAL TELEGRAPHS.

In tracing out the beginning of any great scientific discovery, it is instructive to consider upon what apparently inconsiderable elements it is built up. Just as the raised beach which withstands the most dangerous seas and makes new geographical outlines is constructed of loose stones, thrown together by various agencies, totally ignorant of what will be the result of their labours, so many of our most important inventions have been prepared unconsciously by different minds, until some comprehensive genius links them together for a great purpose.

No discovery of modern times better illustrates this observation than that of the electric telegraph. The bare fact that a flash of electricity would traverse a wire of considerable length was discovered by Grey and Wheeler as far back as 1729; and this may be considered the first step in the discovery; but it was wholly sterile, in the absence of any means by which the current could be made to speak. Nearly a century elapsed before Oersted, in 1819, invented this tongue in the shape of the magnetic needle, which, upon being placed on a pivot parallel to a coil of wire charged with

an electric current, assumed a position at right angles to it; this tongue was only capable of making one motion or sign, but this was sufficient to set other minds upon the track. Arago in the same year discovered that the electric fluid possessed the power of imparting magnetism to soft iron, and our own countryman, Sturgeon, by simply coiling fine copper wire insulated with silk round a piece of this metal, invented the electro-magnet. Hence, by the mere fact of making or breaking contact, the iron became magnetised or demagnetised; or, in other words, motion was produced at the end of a distant wire, by means of an armature, which was either attracted by the magnet, or which recoiled by the aid of a spring, when the electric current was drawn from it at the will of the operator. Here, for some inexplicable reason, however, the progress of the discovery for a time stopped; the clue was in the hands of the philosophers, but the circumstances were wanting to lead them on. The attempt of Ronalds to interest the Government of the day in an electric telegraph he had invented was nipped in the bud by cold officialism, which, in answer to a proposal from him, made the usual red tape answer, "that the telegraph was of no use in times of peace, and that the semaphore in time of war answered all the required purpose." Although Ronalds's telegraph never could have had much practical success, his scheme no doubt set others thinking, and we rejoice that he has lived to receive in his old age the honour of knighthood as a reward for his ingenuity.

But although no sign was made, many minds were simultaneously at work at the great problem. Professor Wheatstone was measuring the velocity of the electric current, and announced the astounding fact, as early as 1834, that a current could be passed eleven times round the earth, or 288,000 miles, in one second. The announcement of a fact outstripping the most visionary ideas of the poet, making Puck by comparison the merest laggard, was the flower speedily to be followed by more astonishing fruit.

In the year 1837, almost simultaneously, three telegraphs were invented; Professor Wheatstone, having consulted with Mr. Cooke, who had been working in the same groove, patented with him a telegraph having five wires and five needles working upon the face of a lozenge-shaped dial, on which the letters of the alphabet were inscribed. This patent was dated in June, and at the end of July, having obtained permission to lay down the wires on the North-Western Railway, between Euston Square and Camden Town station, on the 25th of that month it was put in operation. At the risk of repeating an old story, we cannot help relating the first public utterances of the new tongue destined to be spoken throughout the globe. The audience who listened were all representatives of the new ideas revolutionising the world. Mr. Stephenson and Mr. Charles Fox were the first to hear this new form of human language—electric speech. On the evening of the 25th of the month, in a dingy wooden outhouse close to the booking-office at Euston Square, illuminated by a dip

candle, Professor Wheatstone with his friends, with beating hearts, as the inventor has himself confessed to the writer, listened to the trembling steel discourse as his partner at the Camden Town station touched the keys. "Never did I feel such a tumultuous sensation before," said the Professor, "as when, all alone in the still room, I heard the needles click, and as I spelled the words I felt all the magnitude of the invention now proved to be practical beyond cavil or dispute." About the same time Steinheil's telegraph was put in operation at Munich, but it was not workable, and he afterwards abandoned it for a form of instrument invented by Morse of New York; but to Steinheil must be ascribed the valuable discovery of using the earth to complete the circuit. In September of the same year Morse of New York perfected his embossing instrument, which has been in use in America and Europe ever since. At this time of day it is useless to contest the point as to priority in the invention. The time was ripe for its accomplishment, the introduction of locomotive travelling dragged it from the studio of the philosopher into the working-day world. Swift steam demanded a messenger that should outstrip itself, and science promptly replied to the call. The public were not yet awakened, however, to the value of the servant that waited at their door, and had it not been for Brunel, who with prophetic eye saw the incalculable value of the new invention, it is just possible it might have dropped for years from the scene, inasmuch as the directors of the North-Western gave the inventors

notice to remove "the new-fangled thing"—as one of the directors in his ignorance called it—from the line. At this juncture Brunel adopted it on the Great Western line, where it was carried first to West Drayton, and afterwards to Slough. Here for some time it was kept at the expense of the inventors; and, singularly enough, at this early date it was devoted to the conveyance of domestic and commercial messages, the tariff of one shilling placing it at the service of the tradesmen of the latter town, who made use of it to order the more perishable commodities they required from town. The arrest of the Quaker Tawell in 1845, however, first called into striking notoriety the value of the new agent, and from that day its fate as a working scientific fact of the highest importance to civilisation was apparent not only to educated minds, but to the public generally, who could not fail to be struck with the marvellous powers of the invention tested and proved in so dramatic a manner.

So rapid has been the advance of the telegraphic system that the establishment of the different companies which have carried the wire throughout the length and the breadth of the land is within the memory of all middle-aged men. Whilst private enterprise has fairly accommodated itself to the wants of the commercial part of the community, it has failed to meet the wants of the great mass of the people. Competing boards with duplicate lines manœuvring to produce the highest dividends to shareholders rather than to accommodate the public in the most liberal manner at the lowest charge, led

thoughtful men to consider that a matter so imperial as the conveyance of intelligence should, like the conveyance of letters, be conducted imperially. The admirable working of the Post-office administration naturally led to the conclusion that an analogous duty could be most satisfactorily delegated to that authority, under whose administration a uniform system, somewhat similar to the penny-postage scheme, could be inaugurated, which, serving the public at cost price, might afford to reduce the tariff for messages to its minimum. That such a notion was floating in the public mind we have evidence in the various schemes that appeared from time to time. The plan therefore proposed to the Postmaster-General by Mr. Scudamore was welcomed by the country as the only means of putting the invention into the hands of the people for the every-day purposes of life. This scheme, adopted by Parliament, became the law of the land on the 28th of January last, when all the existing inland land lines belonging to the different companies were purchased for the sum of £6,400,000, and were consolidated under the direction of the Secretary of the Post-office. It was supposed that, together with the inland system of telegraphy, the submarine cables stretching from this country and in the hands of the private companies, would also be absorbed by the authorities of St. Martin's-le-Grand; but either in consequence of the cost of this supplementary system, which might amount to another £10,000,000, or from the conviction of Mr. Scudamore that it would be necessary to thoroughly

master and organise the home telegraphs before he undertook the submarine ventures, he has declined for the present, at all events, even to entertain the notion of purchase, with two exceptions, namely, the short lines running between Lowestoft and Zandvoort, and between Lowestoft and Norderney, and even these two insignificant lengths of cable are by agreement worked by the Submarine Telegraph Company on behalf of the Post-office authorities.

As the public is not generally aware of the advantages that will accrue to it from the Government control of our existing telegraphic system, it may be well to state them in Mr. Scudamore's own words, which we take from the Blue Book on Electric Telegraphy, published in 1868, and which it is intended to carry out to the letter.

"What then [he asks] would the Post-office be able to do for the public if it were entrusted with the management of the telegraphs? —It would be able to bring the telegraphs closer to the population, to extend the hours during which they could be used daily, to reduce the charges for the transmission of messages, and lastly, to give facilities for the transmission of money-orders by telegraph.

"I would propose—

"To open a central telegraphic office at each of the ten district offices in London.

"To open subordinate telegraphic offices at the sorting-offices and receiving-offices in each district.

"To connect the subordinate telegraphic offices of each district with the central telegraphic office of that district.

"To establish direct connection between each central telegraphic office and each other central telegraphic office in London.

"To establish central telegraphic offices at the post-offices of the principal towns in the kingdom, and to establish direct communication between all such central telegraphic offices and the central telegraphic office in the East Central District of London.

"To establish direct communication between the more important of the central telegraphic offices in the provinces and the central telegraphic offices in the West-Central, Western, and South-Western Districts of London.

"To establish a direct communication between each central telegraphic office in the provinces and such of the other central telegraphic offices in the provinces as it might be desirable to connect it with.

"To open subordinate telegraphic offices at the district-offices, sorting-offices, and certain of the receiving-offices in Liverpool; and in like manner to open subordinate telegraphic offices at the principal receiving-offices in such towns as Edinburgh, Dublin, Manchester, Glasgow, Leeds, Bristol, Sheffield, Bradford, and to connect each group of such subordinate offices with its central telegraphic office.

"To open subordinate offices connected in like manner with central offices and at all money-order offices.

"To open deposit-offices, *i.e.*, offices at which messages may be deposited, and the charge thereon paid, at every post-office in the United Kingdom at which no telegraphic office is established.

"To permit the pillar-boxes throughout the kingdom to be places of deposit for messages, provided such messages be written on stamped paper.

"To require payment for messages to be made in stamps or by writing them on stamped paper, and to issue special stamps for the purpose.

"To make the charge for transmission from any one part of the United Kingdom uniformly, and without regard to distance, one shilling for the first twenty words, with an addition of sixpence for every addition of ten words, or part of ten words; such charge to include free delivery by special messenger at any place within the town delivery of the terminal office when that office is a head post-office, and within one mile of the terminal office when that office is not a head post-office; and to include free transmission by post from a deposit-office to the nearest telegraphic office, when the message is so left for transmission, or free delivery by post when the addressee resides out of the limits of the terminal office, and the sender does not desire to pay for a special messenger.

"To fix the rate for conveyance by special messenger at 6*d.* per double mile.

"To make arrangements, on the plan of those prevailing in Belgium and Switzerland, for the registration or the redirection of telegrams, and for the delivery of copies.

"To give facilities for the transmission of money-orders by telegraph, on payment of the charge for the message, and of a com-

mission which shall not be less than two ordinary commissions, under certain restrictions as the amount to be remitted by any one person.

"To effect a reduction corresponding with the reduction of the charges for the transmission of inland telegrams in the charges for the transmission of messages to foreign parts.

"To prepare a telegraphic guide, to be sold at a charge of not less than sixpence, and to contain, together with the rules of the telegraphic offices and instructions as to the best mode of preparing telegrams, an alphabetical list of the pillar-boxes and telegraphic offices in the United Kingdom, distinguishing pillar-boxes from deposit-offices, and telegraphic offices from both; giving the hours of collection from the pillar-boxes, and the hours at which messages deposited in the pillar-boxes before the hours of postal collection would reach the nearest telegraphic office; giving also the hours of the postal collection, or transmission from the deposit-office, the hour at which messages deposited at such offices would in course of post reach the nearest telegraphic offices; the distance of the deposit-offices from the telegraphic offices, and the cost of transmission by special messenger from the deposit-offices to the nearest telegraphic offices if such special transmission were desired by the sender; giving also the hours of business at the telegraphic offices, and the hours of postal delivery or despatch at such offices; from which last data the senders would know at what hours their messages would be sent out in course of post from the terminal offices, when the addressees did not reside within the limits of the terminal offices, and when they, the senders, had not paid for delivery by special messenger."

In order to carry out this scheme in its entirety, the head office in the metropolis is being constructed on a scale commensurate with the great scale of its operations. Not only will it have to carry on the work of all the old offices, but that work will speedily be augmented in a manner which we can only measure by the increased business thrown upon the Post-office since the change made in the postal fee by Sir Rowland Hill. In order to accommodate the great press of business a new building is already rising opposite the General Post-office in St. Martin's-le-Grand. This structure,

in all probability, will exceed in size the Post-office itself. It is estimated the new building will take three or four years in completion ; meanwhile, the Post-master-General has selected for his telegraphic head-quarters the old establishment of the Electric and International Company in Telegraph Street, Moor-gate Street, the most capacious and central of the old established offices. Here, although the arrange-ments are only temporary, a good forecast is given of what will, in its new home, be the sensorium of the nervous system of the empire. From and to this point will radiate and emerge all the wires which place the metropolis in connection with the wires of the three kingdoms, and indeed with the ends of the earth, by means of the apparatus leading to the submarine offices. Some of these wires, suspended in gigantic curves, enter the upper part of the establishment, over the roofs of the intervening houses. Others, again, emerge from beneath the pavement, where they are conveyed in iron pipes from the different lines of railway. Gathered in great bundles, these nerves, so to speak, ascend in a great shoot like the bony case that protects the spinal column, and when they have arrived at the ample apartment termed the instrument-room, they decussate and spread out to the different tables where they may be said to seek their nerve cells in the shape of tele-graphic instruments. This room, the most sensitive spot in the whole world—the cerebrum, which receives and transmits intelligence from all quarters of the globe —may be looked upon as one of the most curious sights

in the metropolis. Although hundreds of minds are simultaneously conversing, some with tongues of steel, some with the clear sound of the bell, some again by means of piano-like notes, which spell the words letter by letter; although we have the clatter of all these sounds mixed with the metallic tinkle of the electric bell, hailing from distant western and northern cities —not a human voice is heard, although, stranger still, the manipulators are all women. According to the rules of the service, the swifter they talk the better, but it must be done in silence with some unseen correspondent at the extremity, it may be, of the kingdom, —a necessary condition in order to insure attention and accuracy whilst the operators are at work. It is certainly no unpleasant sight to see these young women doing the work of the world, proving that they are capable of thoughtful labour, and trustworthy in circumstances of great pith and moment. It is discovered at last that the sewing needle is not the only implement they can master. They are evidently drawn from the middle rank of life, and we are informed that they make capital manipulators, the delicacy of their fingers seeming to point out to them the telegraphic instrument as a suitable means of employment.

Order and arrangement are of course paramount in this instrument-room ; just as in the human brain, different portions are set apart for different work. The first division is occupied with the Metropolitan Room, embracing the vast ramification of wires which place this great capital in almost house-to-house communica-

tion. This apartment has certain tables set apart for the different postal districts; the great centre of business and the resort of fashion of course occupying the largest space. In addition to the ordinary private messages, there are also private wires which transmit telegrams to Buckingham Palace, the Foreign Office, the Admiralty, Somerset House, the Horse Guards, and the House of Commons.

Above the Metropolitan Room is what is termed the Provincial Gallery, with its wires stretching in every direction throughout the United Kingdom, from John o' Groats to the Land's End, and from East to West.

Whilst the visitor is listening to the clatter of one half of Britain talking to the other half, he is aware of a dull thud striking from time to time upon his ear. On inquiry he finds this strange sound proceeds from the pneumatic tube, the new servant the Electric Telegraph has called to its aid; and within a glass case against the wall he sees trained, just like so many fruit trees in an orchard house, long tubes of lead, ending in an oblong-shaped mouth covered with thick plate-glass. As he is watching, a long round pellet is projected into this reception-case with the force of a spent shot, taken out by the clerk in attendance, and immediately opened. It contains one or more telegraphic messages, sent here for transmission by wire to some other office. This office is in fact the Clapham Junction of the Electric Telegraph system. This pneumatic tube at present is only extended to offices half a mile round; but as this half mile is in the busiest part of the City, an area in

which it is difficult to get along fast by foot messengers, porterage work is done in seconds as compared to minutes by this fleet mechanical messenger. Probably all the great district post-offices will eventually be connected with the central office by pneumatic tubes. In addition to the offices within half-a-mile of Telegraph Street which are thus served by this aërial Mercury, the head office at St. Martin's-le-Grand is provided with tubes. The great submarine cables, such as the Atlantic, the Indian, and indeed all the marine lines wishing to use the central office as a means of forwarding messages, will have lines of tube to this room for that purpose. If the reader remembers his old pea-shooter days, he will understand their principle of action in a moment. If he blows he impels the pea, if he sucks he draws it up into his mouth. Pressure and suction are the two forces used in this pea or message-shooter of our maturer days. The telegraphic message comes in a round plug-box, covered with carpet or flannel so as just to make it fit loosely the tube. The suction and propulsive power lies in the depths of the establishment, as we shall presently show our readers, in the shape of a steam engine.

But to return to the Provincial Room. In this department there are one hundred and sixty instruments, principally the Morse or recording instrument the public are so familiar with, the Bell instrument, which spells out the letters by sound; this instrument, the invention of Sir Charles Bright, possesses one great advantage—it employs only one sense, the manipulator writes like

an amanuensis from dictation, and has not to strain his eyes in deciphering the message. This instrument is much used in Ireland, but it has the disadvantage (which experience, however, shows to be of little moment in practice) of not recording its work like the Morse or the Printing Telegraph, consequently the manipulators have at times, when they do not understand, to ask their correspondents to "repeat." The Hughes Printing Telegraph works like a piano, each note or key having a letter of the alphabet upon it—a very rapid instrument, but not very easy to learn. As the different notes are struck, the type-wheel at the sending as well as at the distant station comes into action and prints on an endless slip of paper the required letter. Letter succeeds letter until messages are received, which as they appear are cut off and pasted on a proper receiving form, and then delivered to the public. It is, of the many instruments in use, the most perfect in its mechanical arrangements, and is much approved by the public. In fact, it may be termed a mechanical compositor, who sets up his type from copy read, it may be, hundreds of miles away. This instrument makes such a clatter, that, for the sake of quietness, it has a room to itself. The most extraordinary instrument, however, is Wheatstone's Automatic instrument. A strip of paper, specially prepared, is punched (pneumatic pressure was here introduced by Mr. Culley to save manual labour) with three rows of holes, the centre row, small and of equal distances, serves as a means of propelling or drawing the paper forward in

the transmitter, the top and bottom rows represent the Morse alphabet, and consist, the one of positive and the other of negative marks. The paper passes over two vibrating rods connected at their lower extremity with arms which, by their reciprocating movements, make electrical contacts when required. These rods are placed side by side at a distance equal to the two rows of holes. The transmitter being set in motion by the means of clockwork, the slip is drawn forward, and the rods move rapidly up and down. Whenever the movement of the rod upwards coincides with a perforation, it is projected through, and consequently the lower arm passes over a greater distance, making whilst doing so electrical contact, and sending a current of a positive or negative character along the wire, according to which rod is projected through its proper row of perforation. The instrument at the receiving end records its marks in the ordinary dot and dash, or Morse code, but its electrical arrangement is slightly different, the reception of the current, however short, acts upon the instrument, so that the mark is continued until the current is sent in the reverse direction, restoring the instrument to its normal condition. It will be seen, therefore, that any length of mark can be made by regulating the time of sending the reverse current. Now the top row of perforations representing positive or marking currents, and the lower that of negative or reversing currents, it may be seen that by punching these holes at stated distances from each other the ordinary dot and dash, or short and long stroke of the

Morse alphabet are easily made. Therefore as fast as the punched paper is run through the instrument, it writes its message on the corresponding receiver abroad. This instrument is of great value where there is a press of matter upon a wire, because the slip of paper is run through at the rate of a hundred words a minute with the utmost ease—a most important advantage when long and important documents have to be transmitted. As many as two hundred and fifty messages have been sent within the hour by its agency. It records like the Morse instrument. For press work the Wheatstone has been found invaluable, the paper is frequently punched in triplicate and passed through three transmitters at the same time. Another very common and expeditious arrangement is by using the same slip. Several instruments are placed in a line on the same table, and the slip enters one, is then passed on to the next, and as it comes out is passed on to a third, and so on; it is thus possible for a slip containing a long press message to be in process of transmission through *five* instruments at the same time. This would represent a general and simultaneous transmission throughout the most important towns of the United Kingdom, for the receivers are so arranged as to be intermediate on the same wire, and circuits are so arranged as to fork at different points. Thus one transmitter will serve with equal certainty Bristol, Exeter, Plymouth, Gloucester, Newport, and Cardiff; another, Nottingham, Sheffield, Leeds, and Newcastle; a third, Newcastle, Edinburgh, Glasgow, Dundee, and Aberdeen; a fourth, Liverpool,

Belfast, Dublin, &c., &c. We may state that all these records of messages, wound round like so much riband, are carefully placed away in reserve for a twelvemonth, after which time they are destroyed. Talk of the records in the Tower, what would be the value of a boxfull of these messages a few centuries hence in giving a picture of the social and industrial habits of the nation, if some unborn Pepys could get hold of them!

The news-express wires are busy when the majority of the instruments are silent. There are several associations engaged in collecting and forwarding news to the provincial papers. With Reuter's telegrams we are all familiar. Every morning we see in the *Times* and other papers what is passing all over Europe, India, and America. These associations do for the United Kingdom what Reuter does for the Continent and distant lands. The press wires are at work from 7 P.M. to 3 A.M., and those renting them may send any news they like. The Postmaster-General has no control over those messages. Certain papers are thus daily supplied with any items of intelligence that arrive. The *Irish Times*, the *Glasgow Herald*, the *Edinburgh Daily Review*, the *North British Daily Mail*, &c., are thus put on a par, as respects all news of moment, with the London daily papers. The debates of the Houses of Parliament, by means of these wires, are forwarded almost as quickly as they have issued from the speakers' mouths. Gladstone and Disraeli are quite aware, when they are speaking to the House in the small hours of

the morning, that their words are flying over the land and under the sea, and will be read at every breakfast-table, or whatever the meal may be, throughout these kingdoms, and in every electrically-connected quarter of the globe, the same day. When a speech is written out by the reporter, it is multiplied by means of carbonic paper, one writing giving twelve copies, and those messages being prepared by Wheatstone's Automatic process, the report is sent simultaneously in a dozen different directions; and the reader will, after this explanation, understand what perhaps has hitherto puzzled him,—the manner in which a whole page of a newspaper is, on great occasions, transmitted to the farthest limits of the island, to the seat of Government in Calcutta, to New York, and the cities of the Far West. In the Metropolitan Room may be seen also the national time-keeper or chronofer. This electric instrument sends correct time to all the chief stations in Great Britain and Ireland at 10 A.M., when it is received from Greenwich.

In the two galleries there are at the present time 426 male and 641 female operators. It is found that when fluency in foreign languages is required, men are considered more trustworthy—at all events they are generally engaged to work the continental instruments. In both rooms instruments of different patentees are used, for the reason that the Post-office has taken them over from the different companies it has purchased, and, the language of each instrument being a work of education, the secretary is obliged to adopt the skilled hands

that understand it. No doubt, after he has gained experience in their respective merits, Mr. Scudamore will be able to ascertain the most suitable instruments; and, with his love for simplicity, will be able to adopt more uniformity in his staff. It is an undoubted disadvantage to have such diversity of machinery for the same work. Possibly some secret language, like Wheatstone's cryptograph, will also be used, so that each correspondent may be able to adjust to his own wants, without letting the world—or at least the post-mistress of his little world, if he happens to live in the country—become aware of his domestic and other arrangements. We know it is urged that there is no secret language that cannot easily be deciphered. No doubt an expert may be able to do this, but not that terrible person, the village post-mistress, the head centre of all the gossip of the country round. In the great centres of population we are too far apart, and our affairs are not localised enough to interest the telegraphic clerks in our private matters; but it is far different in the village, where we are all watched like mice by the cat. We know that it is rendered a misdemeanour to divulge the nature of a telegram; but who ever heard of any law that was capable of shutting a woman's mouth when she wished to open it? When we get the postal cards for one halfpenny, and postal telegrams, as they have in Vienna, at a merely nominal rate, the demand for some secret language will be irresistible, as we shall then have the postmen and our own servants let into our secrets.

Before leaving the bevy of fair clerks, we have great pleasure in referring to the consideration and gallantry with which they are treated. The Government has done its best to attend to their comforts; they are provided with a kitchen, where the attendants either warm up or cook their meals, whilst retiring rooms are amply provided. They are by no means hardly worked —seven hours per day is the official time—but they are allowed to work overhours at the usual rate of pay, which is from 10*s.* to 24*s.* a week, 16*s.* being the average income. The value of the manipulator is, of course, according to the speed combined with accuracy with which she telegraphs. The hours are from ten in the morning to five in the evening. The first detachment are all women. The second detachment come in at 8 P.M. and go at 8 A.M.; these are all men, nightwork not being found favourable to the female powers. Sometimes, however, when the maidens have been detained by pressure of work late in the evening, Mr. Scudamore, following the lead of the old offices, sends them home by cab; and the public will not object to his munificence, when we make it known that the "cup which cheers but not inebriates" is presented to them by the Government, with bread and butter.

Before passing down-stairs, we see that mechanical aids are everywhere used for saving labour. The messages for delivery are passed into a shoot, down which they slide, to the messenger department. Of old, the charge for porterage, where short distances were concerned, often came to as much as the message itself.

There was always a dispute as to distance, and but too often a delay in delivery for the want of a messenger. In this respect Mr. Scudamore has wholly revolutionised the whole system. There is a brigade of young lads ready to do his spiriting—no less, we believe, than 800. Some of these boys are on the staff, and are paid from 5*s.* to 7*s.* a week, having in addition a uniform, shoes, and boots, and a breakfast provided for them. Mr. Scudamore has, however, with many of them, adopted the piece-work principle, giving them ½*d.* or 1*d.* per message. He finds the latter system very satisfactory. The lads feel an interest in the work; they are far more active; some of them by ½*d.* messages earn as much as 15*s.* a week. They must work hard to do this, and wear out a deal of Government shoe-leather, but they move about amazingly quick among the courts and alleys of the city. We are glad to see Mr. Scudamore has not neglected to train their minds as well as their muscles—a school is provided for them, in which they are expected to attend during their off time.

In the ground-floor all the motive power of the establishment is placed. The electric currents which traverse the whole system of internal wires are kept alive by 1,300 batteries of ten cells each, stowed away in the cellars. These work the 150 provincial and the 160 metropolitan instruments. The Daniell battery is mainly used, but an ingenious French battery is being tried, and many of them will probably come into use. The wear and tear of these batteries is, of course, enormous, especially in the foggy November weather,

when there is the greatest difficulty in driving the message through the moistened atmosphere. On such days extra force is obliged to be employed; just as in the old coaching days extra horses were put on when the roads were heavy or the country hilly, extra battery power is needed to start the message, and sometimes relays are added on the road when the journey is long. The voltaic action, aided by sulphuric acid, dissolves the zinc and copper plates, and an amalgam is cast down and settles in the trough as a sediment—an equivalent to brain detritus. This is collected periodically, and sent into the North, where the copper is extracted; and the value of metal thus saved in the course of the year amounts to some hundreds of pounds.

But we have not yet done with this subterranean storehouse of power. The transmission of intelligence has advanced from the limited capacity of the postman's legs to a mechanical complexity, that by-and-by will perhaps rival locomotive conveyance; indeed, if we take into account the engines required to manufacture submarine cables, we question much if the electric telegraph does not call upon mechanical skill more extensively than the locomotive. Two steam-engines of forty horse power are employed in exhausting air from, and of pumping air into, the pneumatic tubes. In order to have a stock of this suction and repulsive power always at hand, it is stored away (if, indeed, we may so speak of a vacuum) in huge iron cylinders in every available vacant space. Here also we may see the expeditious manner in which the ribands of paper

in use in the recording telegraph are produced. An enormous roll of paper, four and a half feet in breadth, and a quarter of a mile in length, is wound round the mandril of a turning-lathe. With a sharp knife this roll is cut down to the core, at equal distances of three-eighths of an inch; in this expeditious manner, by the aid of steam, many miles of this riband, destined to receive the messages that will affect the interest of thousands, are cut in the course of an hour. The manufacture and repairs of the telegraphic instruments and appliances of course require the care and attention of a regular staff. The Government does not depend upon extraneous sources for this work, but has established a factory at Gloucester Road, Regent's Park, where all the batteries and instruments are made.

So much for the machinery at head-quarters by which the Government carries on the international electric connexion. We have now to see by what means it is proposed by the Post-office to make the new agent more subservient to general uses than the private companies were enabled to do. Mr. Scudamore clearly saw that in order to give vigorous growth to the telegraphic system it was necessary to bring its collecting rootlets closer to the people. With the exception of some of the great towns, it has hitherto been the custom to place telegraphic offices at railway stations generally at some little distance from thickly inhabited neighbourhoods; hence the difficulty and the expense of porterage, which starved in the bud the desire to use the new agent. No power but the

Government could have inaugurated the necessary reform which has placed the telegraph in the midst of the community. A staff already only half employed in the Post-office establishments of the country was ready to the Secretary's hand. The post-office in all places of a limited population is the centre of life. Here in the money-order office money is paid and received, here news is collected and distributed; to a large class of the people it is at once a bank of issue and deposit, a mart of thought, to which with centripetal force all the neighbours are drawn. To this gathering ground Mr. Scudamore boldly determined to lead the collected fibres of the nervous system he undertakes to spread over the land. Not a day goes by but we hear of the spread of these roots wider and wider. It was only promised in Mr. Scudamore's programme that every place containing upwards of 2,000 persons should have a telegraph added to their post-office; but this promise is now being more than fulfilled, as it is determined to send the wire to every money-order office in the kingdom, which will give the public a much larger number than he originally proposed. Already we see that no less than 3,000 of these electric offices are opened to the public, being an addition of no less than 1,000 on the number of the old offices.

No doubt Mr. Scudamore has long been aware that the nation that discovered the telegraph, that nursed it in its infancy by means of private companies, that has extended it almost round the earth, has still to be admitted to its general use at home. It certainly must

have struck him with astonishment, that whilst we glory in speaking with Calcutta and New York, we rarely think of speaking to our neighbours in the next town or in a distant part of the metropolis by means of the same agency. Whilst Belgium and Switzerland have accepted the stranger as a household friend, we still look upon it with mistrust, and almost dread its finding us out. How many are there in this country who have never either sent or received a telegram? Could we count the number it would amaze us. The greater mass of the population are afraid of it, especially the suburban population, who look upon it with the same distrust with which they looked upon the railroad thirty years ago. Before this curious dislike and mistrust is got rid of, the public must be educated to its use. It must be brought home to their doors, and we shall soon see that the most active and energetic nation, the community that writes and sends more letters than any other, will receive with avidity the new messenger science has sent them.

It must not be imagined that the Post-office authorities, worthily engaged as they are in one of the best-worked public offices, have been officiously grasping at this new method of conveying intelligence, cognate though it be, to their own labours. The absorption of the electric system of these kingdoms has been almost thrust upon them. As early as the year 1854, Mr. Thomas Allen, an electrician of notoriety, suggested the annexation of the telegraphic system to the Post-office, and he was the original suggestor of the uniform

charge of 1*s.* for all distances,—a scheme which was indeed put in practice by the United Kingdom Telegraphic Company, which he founded. In 1856, again, Mr. Baines, an officer of the Post-office, in a scheme then published, foreshadowed many of the improvements now adopted by Mr. Scudamore,—namely, the carrying the wires to the post-office of every post-town, and, more liberal than that gentleman, he proposed a uniform charge of 6*d.* per message of twenty words, between any two post-towns, inclusive of delivery within the limits of the terminal town. Later still, in 1861, Mr. Ricardo, the founder of the Electric and International Telegraph Company, proposed that the telegraphic communication of the kingdom should be placed under the Post-office. That the scheme had evidently been approved of by the commercial mind of the country, the many petitions of the Association of Chambers of Commerce to both Houses of Parliament bear witness. But to an officer of Mr. Scudamore's powerful administrative abilities, the admirable manner in which the telegraphic system had been working in Belgium, where it has been under the control of the State since 1850, must have had most weight, and must have given him confidence in the plan he laid before the Postmaster-General.

It cannot be disputed that the little land of municipal liberty has gone far ahead of us in the application of our own discovery. Compared with the Belgians, we are like the Chinese or Japanese in the adaptation of our own idea. Most of the items in Mr. Scudamore's

programme have been carried out for twenty years in Belgium, and for these last five years the tariff has been reduced for ordinary messages to half a franc. We wish to note this fact more particularly, inasmuch as it should, we think, have given the Secretary of the Post-office a little more courage, as to the result of a reduction in the price of telegrams. But of this presently. Whilst we have permitted the telegraph to be monopolised by private companies eager for dividends rather than solicitous for the public advantage in an imperial matter, such as the transmission of messages and news, Belgium has been working out the invention as a gift to be administered for the good of all; and we at last wake up to the knowledge that we are far behind this small country, and even Switzerland, in an invention which our social and commercial life should make more valuable to us than to any other nation. Of course the advantages of the telegraph are relatively much greater in a large than in a small country; they are in a direct ratio to area and population; consequently the United Kingdom ought to have made more way in the practical application of the wire, as compared with the post-office, than the extremely limited states we have named. But we are still miserably behindhand in the race. Let us take the five years 1860 to 1866 as an example of our position. Whilst in Belgium, in the former year the proportion of telegrams to letters was as 1 to 218, in the latter year they had increased to 1 in 37. During the same time in Switzerland they

had increased from 1 telegram to 84 letters to 1 to 69 letters. During this period the United Kingdom, compared with Belgium, at least had almost stood still; at all events the proportion of telegrams to letters, which in 1860 was as 1 to 296, in 1866 was but as 1 to 121.

It must not be supposed that our great inferiority in telegraphic communication is in any way accounted for by the expense per mile of constructing, working, and maintaining the wires in these islands, for the contrary is the case; for whilst all these items in the United Kingdom cost £4 10*s.* 2½*d.*, in Switzerland they cost £5 3*s.* 2*d.*, and in Belgium £5 7*s.* 6*d.* In the supplementary report to the Postmaster-General from the principal Secretary, from which we have quoted these comparisons, that gentleman says :—

"It is clearly shown . . . that the cardinal distinction between the telegraphic system of the United Kingdom and those of Belgium and Switzerland is this :—that the latter have been formed and maintained solely with a view to the accommodation of the public, whilst the former have been devised with a view to the interest of shareholders, and only indirectly for the benefit of the public. It is shown that the cost of providing telegraphic facilities is not greater in this country than on the Continent, and that consequently it is not necessary to restrict the provisions of such facilities more narrowly than elsewhere, or to make higher charges for their use and enjoyment."

It must be admitted that Mr. Scudamore has more than fulfilled his promise to bring the telegraphic system nearer the public. Let us take, for instance, the metropolis and its suburbs. As far as the intercommunication of its inhabitants was concerned, it was almost entirely dependent upon the wires of the District Telegraphic Company. This Company possessed ninety-

five receiving-houses. These have, with few exceptions, been closed, and their places have been taken by the Post-office receiving-houses, numbering 425; in fact, more than quadrupling the old facilities for house-to-house communication. It cannot be doubted that we shall speedily see the wisdom of thus putting the wire into our hands, as it were; and but for one alteration, we do not doubt but that in the hands of the Government this great diffusion of the telegraph would have met with a splendid and instant response, as compared with the results produced by the working of the private Company—we allude to the augmentation of the tariff from sixpence to one shilling. It seems to us that here, at least, we have gone back. Within a radius of two miles it is still as cheap to send a messenger as to use the telegraph. We are told, indeed, that considering the porterage, the sixpence always mounted up to a shilling, and that consequently the Post-office have really made no advance on the total price of the message; but this is not an exactly fair way of looking at the case—we may have cheap porterage as well as cheap telegrams, and the Secretary takes credit for having provided us with it. In the head office the messengers are glad to carry telegrams half-a-mile for a halfpenny, and a mile for a penny; with very few exceptions the larger distance would cover the porterage in the metropolis at least. It must be conceded that our relations with distant cities are incomparably trifling compared with our more immediate relations. For one letter sent into the country, the Londoner

writes fifty to town correspondents. The same proportion would undoubtedly obtain with respect to these metropolitan telegraphs provided the public could recover the sixpenny tariff. In the year 1865, when the old Company had only eighty-three stations open, it forwarded 316,272 messages. It would be difficult to estimate the number that would pass under the cheap rate from the 489 postal telegraph offices that have taken their places. Surely, when telegrams are sent all over Belgium and Switzerland for fivepence, and at this rate pay their Governments, the metropolis and other great towns of the empire should not be deprived of an equal advantage; and we think we may with effect here reproduce Mr. Scudamore's own words :—

"It is not necessary to restrict the provisions of such facilities [those of Belgium and Switzerland] more narrowly than elsewhere, or to make *higher charges* for their use and enjoyment."

We know the argument will be used against us, that if the uniform shilling rate were departed from, a scale of graduated payments according to distance would be the only logical sequence, and possibly the uniform penny fee will be quoted in opposition; but there is all the difference in the world between a penny and a shilling. The time may arrive, perhaps, when a halfpenny delivery may come in vogue; no one would care much to save the halfpenny, but the saving of sixpence would be quite a different matter. A minutely graduated scale, no doubt, would entail much more extra labour; but a uniform sixpenny tariff within a few large towns would scarcely mar the original simplicity of the

shilling scheme. We have so high an opinion of the administrative skill of the Secretary of the Post-office, that nothing but the clear justice of the case compels us to dwell upon this, to us, obvious shortcoming of his programme.

It is a very good thing to be able to send a telegram to the Land's End or John o' Groat's House for a shilling, but how many of us want to do so? The practical value of an invention is measured by the answer it makes to our daily wants. Now we do want to talk with those with whom we are in daily mutual relationship; but what the gulls are saying in the far west, or what the sheep may be about in the bleak northern limit of the land, troubles but few people. Give us back then, we say, the old sixpenny metropolitan tariff, together with all the improvements offered by the postal establishments, and a prompt answer will be made by the great civic populations to such a wise departure from the hard-and-fast line of uniformity.

We do not doubt but that Mr. Scudamore is fully aware that a uniform tariff which is found to pay in the two small countries we have named could not fail to succeed with the population of these kingdoms. Viewed in this light, it is possible that he contemplates a reduction to a sixpenny rate, after he has tested the working of the scheme for a few years. If this is the reason for his insisting upon a uniform rate, we may be content to wait for its realisation, otherwise we think our argument is unassailable.

Irrespective of the value of the telegraph pure and

simple in the hands of the Post-office, we have to consider the facilities of working the postal telegraphic system—in other words, the method the authorities of St. Martin's-le-Grand will have of completing the one power by the other. In all cases where great speed is not required, we are inclined to think that the mixed system will meet the wants of a large section of the community, and it will certainly be very economical. We cannot do better than give, in the words of the Secretary of the Post-office (written in 1868), the method of working this double system:—

"I will take the case of a person residing in a suburban district of London, for instance, Sydenham, receiving a letter from a correspondent in a suburban district of Liverpool, by the first morning delivery, and desiring to send an immediate reply, in the hope of receiving a rejoinder from his correspondent by night mail. As matters at present stand, he can send a telegram through the London District and Electric and International Telegraph Companies; but to do this he must walk or send to the telegraph-office, and the transmission and delivery of the message will in no case cost him less than 1*s.* 6*d.* for twenty words. The cost will increase with the distance of the addressee's residence from the receiving telegraphic office, and in all but extremely urgent cases the labour and the cost combined will deter him from using the telegraph. If the scheme which I have described were in operation, and if he could confine his message to twenty words, write it on stamped paper, and deposit it in the nearest pillar-box or deposit-office before 12.45 P.M., he would secure its delivery free of further charge beyond one shilling in any part of the postal district of Liverpool by 5 P.M., which delivery would leave his correspondent ample time for a rejoinder by night mail. The course which the message would take in this instance would be as follows:—From the pillar-box or deposit-office to the sorting-office by telegraph, through the South-Eastern District office, and the East Central office to the Liverpool office, and from the Liverpool office by the 3.45 P.M. delivery to the addressee.

"But let us suppose that the resident at Sydenham desires something more than a rejoinder by night mail: let us suppose that he desires his correspondent to leave Liverpool by a train starting from

Liverpool at 5 P.M. In this case he might, if the scheme which I have indicated were in operation, take his message to the Sydenham sorting-office by say 11 A.M., and secure its delivery for one shilling in any part of the postal district of Liverpool at 3 P.M.; which delivery would give his correspondent time to catch the 5 P.M. train.

"Or let us take the case of a solicitor having his place of business in Chancery Lane or Bedford Row, and being desirous to summons a number of witnesses from the suburban district of Liverpool, and at the same time to send the money on account of the expenses of their journey. Such a solicitor, if such a scheme as I have described were in operation, might not only, by depositing his message at the West Central office by 11 A.M., have a copy sent to each witness by the 1 P.M. delivery of Liverpool, but might at the same time furnish each witness with a telegraphic money-order, and the witnesses would have ample time to obtain cash for those telegraphic money-orders before their departure from Liverpool on the same day."

This scheme no doubt is very convenient, but unfortunately it is only likely to be a matter of the future, inasmuch as the forwarding of money-orders by electric telegraph has been deferred, at least for the present. Seeing that money-order telegraphic offices are the centre of life of the new system, it certainly is to be regretted that their usefulness, after being promised in such glowing language, is still *in futuro*. The scheme is in full work in Belgium, and we cannot see that its introduction here would overtax the powers of the Post-office. These facilities were given us by the Electric and International Company; it is hard that the public should have to pay dear for intercivic telegrams, and at the same time have less facility than it had before.

It would seem that our natural predilection for the sea has shown itself in the vigour with which our public companies have already, or are preparing to thread the

ocean with electric cables. When the first cable from Dover to Cape Griznez was made in 1850, and its rapid destruction took place through fretting upon the rocks of that promontory, other ventures, it might have been thought, would have been discouraged, but, on the contrary, the mishap only served to incite us to further exertions. In another month, a still stronger cable, well armoured with iron wires externally, was constructed. But Neptune again seemed to resent the intrusion upon his domain; for whilst the cable was being laid a gale of wind sprang up, the cable was violently dragged out of the ship, and she drifted full a mile out of her course, and in addition, a kink, or twist in the cable, took place. These mishaps so shortened it, that when an attempt to land it was made, it was found to be half a mile too short. A fresh piece was, however, spliced, and this very cable—the first that ever laid in sea-water, has remained in perfect condition ever since. These mishaps, however, were sufficient to create grave doubts of the practicability of laying marine cables of any great length. It was admitted that we knew nothing of the bottom of the ocean; it was supposed to be interspersed with hills and valleys, and submarine rocks just as abrupt as those found in mountainous countries; and it was suggested that the feeble cable, suspended from point to point of these elevations, would inevitably break by its own weight; that unknown ocean currents would drift the cable away; and it was gravely argued in a volume written by a naval officer, that it would never sink to the

bottom when laid in oceans of great depth, the condensation of the water being sufficient to suspend it in mid-ocean. Unacquainted as we were with the laying of submarine cables, it did seem discouraging to find so many disasters occurring in a channel only twenty miles across; but further knowledge has taught us that these are the most dangerous of all places in which cables can be laid. The rush of waters in such confined channels is far more disturbing to their position and to their subsequent repose than are the deepest ocean beds. Marine life, which is sometimes injurious to cables, is also more abundant; and in addition, there are all the chances of breakage consequent upon their being within anchorage ground, and their liability to be dragged by ships. These circumstances are all drawbacks to these small ventures, from which the larger ocean cables are free.

The next cable attempted to be laid was the one between Donaghadee and Port Patrick, by the Magnetic Telegraph Company, in 1852. This failed in consequence of a violent storm in the comparatively shallow waters of the Irish Sea. The failure, again, of the cable from Orfordness to the Hague, in 1854; the Varna and Balaclava, in 1855; and of others, either from being laid in shallow water, or from being too slight, and more especially the destruction of the Atlantic Cable from Valentia to Newfoundland, in 1858, through defective insulation, completely discouraged speculation, especially in the longer lengths of submarine cables. The public looked upon such ventures

as purely speculative! some, indeed, who should have known better, condemned them as impossibilities; and the chance of speaking with our children across the Atlantic was looked upon as a mere dream to impose upon shareholders. Science, however, was not to be denied; she still, although cruelly balked, believed in the perfect feasibility of the undertaking. The cable had spoken during the month that had elapsed before it failed: 366 messages passed through it between this country and America. The Queen had addressed the President in words of congratulation; our War Office had stopped the departure of two regiments from Canada, at a saving of £50,000; and we had received the news of the safe arrival of the *Europa* after her collision with the *Arabia*. The engineers discovered where the electrical leakage was, and measured it off to the mile in which it occurred. Having proved that we could pass the electric fire beneath the deep sea for such a distance, it was not to be supposed that the enterprise would be abandoned; although for a moment there had been a failure, those best able to judge had discovered the various causes that led to it.

It was seen that with cables that had to be submerged to such a tremendous depth, it was advisable to construct them proportionately stronger and specifically lighter than the first Atlantic line, so that they might be more easily recoverable. It was also obvious that for so long an unbroken circuit, the copper conductor should be larger and the gutta-percha insulator more perfect, so as to enable a greater speed of transmission

to be obtained with a less current; the fact being ascertained that, the weaker the electric charge capable of producing an effect at the other end, the less tendency it would have to burst its way through the gutta-percha at any defective point, and get to earth, and therefore the more likely the cable would be to last. It was eight years, however, before public confidence could be re-established. Through this period of despondency, however, the Company managed to keep the venture afloat, and in 1865 a new cable was manufactured both stronger and specifically lighter than its predecessor, with a far heavier conducting strand. The great additional weight in the cable, however, led to a change in the method of paying it out. For the former cable the reader will possibly remember two ships were employed for that purpose, the *Agamemnon* and the *Niagara*, supplied by the navies of England and America. Each ship had its appointed load; they met in mid-ocean, and having spliced the two ends, separated for either shore. But neither ship of war could carry the far bulkier and heavier cable about to be laid (as it was, the *Agamemnon* nearly foundered in the great storm which overtook and displaced the half length she had on board), and the necessity of the case called for the instrument that had so long lain idle, and had been deemed but a costly failure of an ambitious engineer. Great events cast their shadows before them, and great geniuses, by an unconscious foresight, forecast their designs to ends that are hidden from them. When Brunel drew the lines of the *Great Eastern*, how little

he imagined she was to be the means of joining in speech two quarters of the globe; how little the shareholders that sneered at his costly experiment thought they were co-operators in an event that would make a lasting mark in civilisation. The *Great Eastern* had at last found her mission; with her enormous carrying capacity, the whole length of the cable could be stowed in her with ease. The paying out of the line commenced on the 23rd of July; all went well the first day, but on the second a fault in the insulation was discovered a few miles from the ship, and it was necessary to pick up the cable; when about ten miles had been recovered, the fault was found to have arisen from a piece of iron wire that had pierced the gutta-percha and touched the conductor. This created great consternation among the engineers, as the accident was supposed at the time to have been a deliberate resolve by some one on board to stab the cable. The piece was cut out and repaired, and for another five days the process of paying out went on well. On the 29th of July, however, when the ship was in soundings of more than two miles deep, another fault was discovered. From this depth the cable had to be hauled back. Again the same cause was found to have produced the mischief, and after repairs the ship again proceeded. For a third time, however, on the 2nd of August, another loss of insulation was discovered, but in this instance the cause of the mishap was never known, for whilst the cable was being lifted at the bow, the hawse hole of the ship, as she drifted, caught and so chafed it that it broke.

Nothing daunted, the process of grappling for the cable was immediately proceeded with. Again and again the rope was caught by the grapnel—once, indeed, it was lifted more than a mile—but in each instance the wire rope of the lifting apparatus was not strong enough for its work, and when at last all the picking-up apparatus had gone the way of the cable, the expedition had sorrowfully to return home.

Nothing daunted by misfortune, after all promised so well, the Company determined to manufacture a new cable, and make a final attempt. It was clearly proved that the mishap had occurred through circumstances that were quite irrespective of the feasibility of the attempt. Either the cable had been stabbed purposely, or the wires covering the cable must have sprung and wounded it. In either case, the cause of failure could be avoided in the new venture. It was also certain that with a sufficiently strong picking-up apparatus, the cable, if lost, could be recovered and repaired even in the deepest water. Taking this sanguine view of the case, a new Company was immediately formed under the name of the Anglo-American. The new cable was manufactured without the tardy composition covering the outside strands of wire, in order to give a quicker discovery of any fault, and a more perfect gutta-percha insulator was adopted. For this expedition the testing for faults were made continuously, no period being allowed to elapse, as in the cable of 1865, for passing messages between ship and shore. By the new arrangement, both processes were carried on at the same time,

and thus the danger of ceasing for a moment the insulation test was avoided. We may here mention incidentally that so perfect was the nervous life, if we may so term it, of the cable, that every time the ship rolled in mid-ocean, the throb was conveyed along the wire to the watchers at Valentia in Ireland.

A singularly ingenious instrument, the galvanometer, has been adapted for the purpose of testing by Sir William Thomson, by which a signal is produced by an extremely minute movement of a magnetic needle, worked by the feeblest current passing through the cable. We quote a description of this delicate instrument from Bright's edition of Lardner's "Electric Telegraph":—

"The apparatus, which is similar in principle to Gauss and Weber's telegraph of 1837, consists of a small and exceedingly light steel magnet with a tiny reflector or mirror fixed to it—both together weighing but a single grain, or thereabouts. This delicate magnet is suspended from its centre by a filament of silk, and surrounded by a coil of the usual copper wire silk covered. When electricity passes through the surrounding coil of wire the magnet and mirror take up equilibrium between the elastic force of the silk and the deflecting force of the current of the cable circulating through the coil. A very weak current is sufficient to produce a slight though very perceptible movement of the suspended magnet. A fine ray of light from a shaded lamp behind a screen at a distance is directed through the open centre of the coil upon the mirror, and reflected back to a graduated scale upon the side of a lamp-screen turned towards the coil. An exceedingly slight angle of motion of the magnet is thus made to magnify the movement of the spot of light upon the scale, and to render it so considerable as to be readily noted by the eye of the operator; this ray is brought to a focus by passing through a lens. By combinations of these movements of the speck of light (in length and duration) upon the index an alphabet is readily formed."

The inventor has, since this paragraph was written,

added a recording appliance, which is noticed in the *Times* in the following terms:—

"The new instrument receives and indicates everything indicated by Sir William's earlier invention, and writes it indelibly; this is accomplished without any sacrifice in the sensitiveness of the instrument. A very fine glass siphon waves to and fro over a running strip of paper without touching it, and from this siphon ink is spurted on to the paper by a series of electric sparks, these sparks being generated by a peculiar induction machine. This fine rain of ink leaves a trace of the position of the siphon at every instant, in a fine continuous line. The siphon follows faithfully the rise and fall of the received current, and these alternations are arranged so as to form an alphabet, as in the usual single needle instruments. The rain of ink opposes not the slightest resistance to the free motion of the siphon. The instrument has been doing commercial work on the French Atlantic Cable for a couple of months in the island of St. Pierre."

The mere discovery of a fault, however, after the cable has passed out of a ship, would be of little avail unless the electrical engineer were able to localise it. How this is done is the greatest marvel of all the marvellous curiosities of electricity to non-scientific persons. To be able to measure the distance at which a fault or hole in the gutta-percha insulator, not bigger than a pin's head, exists in a rope 2,000 miles long, at two miles depth in the sea, seems incredible; but, were it not for this power, notwithstanding our skill in cable manufacture, the danger in laying them would be so enormously increased that the art would be nothing more than purely speculative. It is difficult to explain to the non-scientific reader the method by which the electrician sets to work to make this discovery; but we may perhaps be permitted to quote from an able article

on submarine telegraphy, in the September number of the *North British Review* of 1866, the following comparison of the flow of electricity through a cable to the flow of water through a pipe, which, to those not versed in the technical terms of electric science, will make the matter tolerably clear :—

"Let us take a pipe one hundred and fifty yards long, and suppose that we know exactly how much water will run through any given length of pipe of that diameter from given cisterns at each end. Now, suppose a leak to occur in that pipe ; if we stop up the far end, and let the water run in from our cistern, we find that as much water runs out as would be allowed to pass by a pipe ten yards long ; we then stop up our end of the pipe, and let the water run out from the far cistern ; we find as much water is conveyed away as would be allowed to pass by a pipe of one hundred and fifty yards long. Then, as in the electrical case, the leak in the pipe must clearly be five yards of pipe. Thus the position of a leak in a water-pipe might be discovered although the leak itself were buried in the ground. The electrical experiment is quite analogous to this, and is in practice much more easily made, for the laws of the flow of water in pipes are much less well understood and less simple than the laws of the flow of electricity, although we may think we know better what water is than what electricity is.

"In cables containing more than one wire the above test, or something analogous to it, can always be made, for the faulty and good wire being joined together at the distant station, can be treated as one conductor, of which the observer has the two ends in his possession. He can then arrange his tests so that his observations at both ends are simultaneous with the fault in the same condition when added to the two circuits. . . . Another class of fault is more easy to manage. If by accident the pipe get choked up, instead of getting a hole in it, nothing would be easier than to tell where the obstruction lay by measuring the quantity of water we could pour into the pipe before filling it. Then knowing the capacity per unit of length we could calculate the distance by simple division. Exactly so the capacity per unit of length of an electric cable for electricity can be, and is, measured ; so that if a conductor is broken inside the insulating sheath, without a fault of insulation occurring, the distance of such fault can be obtained by a simple measurement of the charge which the insulated conductor will take."

Thus provided with a better cable, and a means of testing continuously, the third expedition started on the 13th of July, 1866. All went on well until about mid-passage was made, when a turn of the cable fouled as it came up, and brought three others with it, making a confused knot, like that on an angler's line ; but, the ship being instantly stopped, the foul flake was set straight again, and without another mishap the cable was landed on the 27th of July. Thus the greatest engineering experiment of the century, after failures that would have broken the spirit of any other nation, at last succeeded through the sheer determination of the scientific men who carried it through.

But, with the greetings that passed between the Queen and the President, Sir Samuel, then Mr. Canning, was not content. Beside the living wire that carried them, there lay the dead wire of the former year not far off, representing £600,000. To recover this booty was worth a trial. He had now the means, and, as the event proved, the skill to accomplish it. Even to well educated persons there is something so astonishing in the fact that it amounts to a marvel more astounding than anything in the "Arabian Nights." Here was a mere spider's thread, for so it may well be called in comparison with the deep ocean in which it lay, the very whereabouts of which was lost sight of. To hit upon this film merged in the ocean upwards of two miles in depth, this modern Gin set to work. The tackle with which he groped for this regal prize was a grapnel, with springs so inserted as

to prevent the cable surging from its flukes when hooked. This grapnel was secured to a fishing-line of steel wire and hemp spun in strands together. Its strength was sufficient to bear a strain of thirty tons. The winch with which this powerful line was hauled in, consisted of a pair of large drums at the bow of the vessel, worked by a donkey engine. To make the analogy to a fishing-line more complete, a dynameter was attached to the line, which acted like a float, and marked when the grapnel was nibbling at the sunken cable. The bite was, however, in proportion to the magnitude of the tackle; just a feel at the hook was indicated by an additional pull of three tons, which increased as the prize neared the surface to eleven tons. The first stage in the process was to gain the exact spot where this gigantic bottom-fishing was to begin. To the multitude this would seem like looking for a needle in a bottle of hay. The only clue to the whereabouts of the lost prize lay in the observations made by Captain Moriarty, when it ran overboard. To this point, in latitude 38·5°, the ships constituting the squadron repaired. Here, on the 10th of August, in water 14,000 feet deep, or the height of the peak of Mont Blanc, the cable was hooked, lifted some distance, and buoyed by the *Albany* grappling ship, but the buoy-chain parted in a gale of wind on the night of the 12th. The *Great Eastern* and the *Medway* came to the rendezvous. We may picture the extraordinary excitement of the little group of engineers on the bow of the former as the grapnel groped along the bottom of the ocean for

this waif and stray. On the 18th of August it was caught and buoyed, but the rope slipped in the act. Two days afterwards the cable was lifted bodily out of the water, but, whilst all hands were cheering, it parted and slipped back again to its ocean bed. After hooking and missing it many times, until they were, in Captain Anderson's words, "shattered in hopes and in ropes," which had fouled the cable in their efforts to secure it, they determined to proceed to a shallower part at longitude 36.7° west. On the 1st of September, in calmer weather—

"The cable was caught by the *Great Eastern*, lifted a mile and three-quarters from the bottom and buoyed. She then shifted ground a few miles to the westward, and at night again hooked it. The *Medway* at the same time grappled the cable two miles further west, and was signalled by the flashes of light to haul up quickly so as to break it, and thus take the strain off the portion the great ship had hold of; she did so, and the bight then came in readily but slowly, as if reluctant to leave the soft ocean bed upon which it had been so long reposing. The vast ship hung lightly over the grappling rope, as if fearful of breaking the slender cord which was clenched in the iron grasp of the grapnel flukes 10,000 feet down in the depth of the sea. With a strain of eleven tons upon it, the tough unyielding fishing-line came in over the bows as rigid as a bar of iron, and as slow but sure is an axiom in cable-fishing, so slowly but surely coil after coil of the huge grappling-rope was drawn on board by the picking-up machine until at last, amidst breathless silence, the long-lost cable for the third time made its appearance above water. The voices of Mr. Canning, Mr. Clifford, and Captain Anderson were alone heard as their arrangements were made to put huge hempen slippers over the cable, which were speedily attached to a five-inch rope, and having been relieved from the tenacious grasp of the grapnel, was hauled in by the machine, after cutting away the western end of the bight."

The ringing cheers with which in mid-ocean, upon testing, it was found that the cable was in perfect

order, may be imagined; neither can we omit to mention the dramatic incident that was at the same moment taking place in the telegraphic cabin in Foilhummeran, Valentia, where the staff had been watching day after day, almost all hope of success having been lost.

"Suddenly, on Sunday morning, 2nd September, at a quarter to six, while the strong ray of light from the reflecting galvanometer was being watched, the operator observed it to move to and fro upon the scale. A few minutes afterwards the unsteady flickering was changed to coherency; the long-speechless cable began to talk, and the joyful assurance:—'Canning to Glass—Valentia: I have much pleasure in speaking to you through the 1865 cable. Just going to make splice.'"

Thus the courage of the Company in making the second venture was rewarded by the recovery of the whole loss of the previous year; and, more encouraging still, it was found upon the completion of the splice that the 1865 cable was even better than the last one laid; the twelvemonth during which the 1,200 miles of cable had lain in the bottom of the sea had so condensed the insulation that the wire yielded better results. When fished up the cable looked like a party-coloured snake; the under half that had sunk into the ocean bed of grey ooze formed by microscopic shells, and the upper half uncovered being black. Thus the bottom of the Atlantic was found to be the safest resting-place of a telegraphic line. The level plateau which runs from the coast of Ireland to Newfoundland, is composed of countless millions of sea creatures, killed and deposited here through the ages by the sudden change of tem-

perature caused by the arctic current here bounding the Gulf Stream. This successful experiment has for ever laid at rest the feasibility of traversing great marine depths with the electric wire, such cables once laid being secure from the dangers troubling those in shallow waters, the sea in deep soundings being perfectly tranquil and free from the animal life which is so profuse in ocean beds of shallow depth. Both of these remained for some time in good working order, but we understand that the cable of 1865 has since again been under repair. The knowledge gained of the folly of forcing messages through poorly insulated cables by an increase of battery power was of immense value to electricians. The failure of the cable of 1858, it is now believed, was caused by this misapplication of power, a leak once occurring becoming rapidly enlarged by the forced current rushing through it to earth.

In order to show the small power with which a well-insulated cable can be worked, Mr. Latimer Clark had the ends of the two conducting wires of these cables connected in Newfoundland, and thereby made a loop of 3,700 miles. Through this continuous wire, with a little acid placed in a lady's thimble, together with a small piece of zinc and copper, he succeeded in passing signals through both cables in a little more than a second of time. In July, 1869, a third cable was successfully laid between Brest and Boston, touching on the way at the Island of St. Pierre. We, hear, however, that for some little time this cable has been out of

order, and is in course of repair in that small portion of it running from the Island of St. Pierre to Newfoundland. The cable of 1866 is, however, so efficient that it is able to do triple work. As the three Atlantic Companies have come to an agreement with respect to working expenses, and have also engaged in case of need, such as now occurs, to forward each other's messages, the delay caused by repairs will not be of so much moment. A short cable from Brest to Porthcumow, near Penzance, has been laid, and gives to the British public the convenience of an extra route to the United States.

The recovery of the lost Atlantic cable is not an isolated instance of the power of fishing them up from deep waters. A similar feat to that performed by Sir Samuel Canning was accomplished by Sir Charles Bright in 1869, whilst laying the cable between Florida and the Havannah. The Gulf Stream here rushes like a mill-sluice through the narrow Florida channel; notwithstanding which, and despite the rocky coralline nature of the bottom, the cable was safely recovered from a depth exceeding a mile, spliced, and safely laid, and is now in admirable working order, and forms one of the links which are to thread the West India Islands, and will in a short time place North America and Mexico in communication with nearly the entire seaboard of South America, the cable on the west of that continent extending as far as Valparaiso, and going inland to Buenos Ayres, and on the east skirting the coast past Pernambuco, Rio de Janeiro to Monte

Video, and by Rio de La Plata until the circuit is complete at Buenos Ayres.

It is now generally understood that the submerged cable is less likely to get out of repair and less liable to injury than land lines traversing uncultivated regions; and this holds true in times of war as well as in times of peace. In all probability the conference about to be held at Florence with reference to submarine cables will decide that an international understanding shall be come to, holding these true messengers of civilisation inviolable in time of war. Deep-sea cables are, of course, quite safe from the attacks of semi-barbarous populations. We have found that it requires all the resources of a rich people, and all the appliances of science, to fish up a deep-sea cable; a vessel especially appointed for the purpose, and so encumbered with machinery, would stand little chance of doing mischief. Such a craft could not escape observation, would be certainly closely watched, and neither in a condition to fight or to run away. In looking at the telegraphic map of the world, the growing predilection for submarine lines is remarkably obvious. The cable that has just been landed at Falmouth forms the last link of the submarine line which puts us in connection with India, and will very speedily link us with Australia, China, and Japan. By means of these sea-protected wires we avoid all the dangers and delays of the land lines forming the Indo-European system. It was felt that our connection with our Indian empire should not be at the mercy of countries that

may not always be friendly with us. Especially our Government and merchants felt the necessity of being independent of Russia, through which empire a portion of the Indo-European line passes, and also the northern line, crossing the frozen steppes of Siberia, on its way to the Amoor River, China, and Japan. Even in peace these lines, running through desert wastes, are continually getting out of order, and are liable to be destroyed by weather (especially snow-storms), as well as by the assaults of man and the wild animals. Even in semi-civilised India it is found that wires, such as we use in Europe, are liable to be twisted by troops of monkeys; and flocks of the largest of all birds—the adjutant—perch upon them, and by their mere weight break them down. The engineers, consequently, are obliged to employ as conductors rods of metal three-eighths of an inch in thickness. The effect of storms, so often occurring in tropical countries, is for the time destructive to electrical communication, and even fatal to the workers, the lightning running along the wires, and striking down the manipulators at their instruments. In cold countries, again, heavy falls of snow constantly place the wires *hors de combat*. When we say that the heavy snow-storm that fell in England in 1866 cost the Electric and International Company £10,916, in damaged wires alone, what may we expect will be the destruction of the land wires running through the frozen land of Siberia, and what the fate of messages in mere average Russian winters? We are told also of stockbrokers' tricks, not less damaging

to the wires than variations of weather. When cotton is fluctuating, it is said that messengers are sometimes despatched upon dromedaries, with nippers to cut the wires where necessary. Great heat appears to be equally injurious to the free working of the electric wire. It is stated that during the months of July and August the telegraphs in South America cannot be worked from two to six in the afternoon, the hottest hours of the day. The reason is not fully understood, but atmospheric effects are supposed to be the cause. In certain waters, such for instance as the Mediterranean, cables are liable to attacks from the teredo worm. This creature has a great appetite for hemp, and all the cables covered with that fibre were found to be perfectly honeycombed by its saw-like teeth, leaving the wires loose underneath. Such cables are now served with a composition patented by Mr. L. Clark, which contains in it a large amount of powdered silica, a substance that seems to take the edge off the worms' cutters and blunt their destructive powers.

Independently of the objection to wires passing through intermediate states between this country and its dependencies, the difficulties foreign clerks have in translating our messages are fatal to such lines. The *Times*, at the beginning of the year, gave an example of the mutilation such messages coming from China suffered during transmission through wild countries, at anything but electric speed. The following curious jumble of words is a literal copy of a message received by the Russian Northern Line, and so printed, having taken two calendar months in its passage :—

"Treaty reorgan duty on opium raised to fifty teals duty on silk doubled right to a treaty post in Haman to thirteen dired and ports of wenchow and nohamn yantze to be opened a chinclu gowernment steamer to tow Suropean merchants boros of day goods on the pagano lake the three eral mines of Kalong lurprlurping and cheyong to be opened to European a trunt duty of two once a half per cent. to be owen om imports of treaty ports on and to the present duty of five per cent. Imports. To the subsequently. Held free of duty by chynesi goot of the goods are taxed a receiptes to begiven and the amount levied made good by the Government bonded ware house to be ertallested at treaty ports courteous of some to be arranged by the Chinese Government."

These hieroglyphics when deciphered read as follows:—

"Treaty negotiated—Duty on opium raised to fifty taels. Duty on silk doubled. Right to a treaty port in Hinan. . . . and the ports of Wanchow and Nohamo on the Yangtze to be opened. Chinese Government steamers to tow European merchant boats of dry goods on the Poyang lake. The three coal mines of Kelung. . . . and Cheyong to be opened to Europeans. A transit duty of two and a half per cent. to be levied on imports at treaty ports in addition to the present duty of five per cent. Imports to be subsequently held free of duty by the Chinese Government. If the goods are taxed, a receipt to be given, and the amount levied to be made good by the Government. Bonded warehouses to be established at treaty ports; conditions of the same to be arranged by the Chinese Government."

The sea-route, for the reasons already given, having a decided advantage over land lines, and as we are the sole manufacturers of electric cables, it may be assumed that British capital will be mainly employed in filling up the gaps that at present exist in the electrical connection of the world. In order that our readers may see at a glance the astounding progress electric telegraphy has taken within a few years, we append the following list of cables, by which it will appear that nearly every quarter of the globe is now bound in these bonds, which abundantly promise a rapid advance in civilisation:—

Submarine Telegraph Cables, laid and worked in June, 1870, or in course of manufacture and expected to be laid within twelve months.

Name of Company.	Termini of Cables.	Length in Nautical Miles.	Date when Opened or expected Opening.	Remarks as to Connections.
Submarine Telegraph Company	England and France, 5 cables; England and Belgium, 2 cables; England, Jersey, and France, 1 cable; *England & Holland, 2 cables; England and North Germany,* 1 cable *	About . . 1,100	First submarine cable ever laid, Dover to Calais in 1851; the other cables at various times subsequently.	Worked in conjunction with the British land wires and on joint account, under Parliamentary agreement, with the Post-office
Jersey & Guernsey	England to Channel Islands	About . . 119	July, 1870	Post-office property
Anglo-American	Ireland and Newfoundland, 2 cables	1st cable . 1,852 2nd cable . 1,898	July, 1866	Amalgamated with its predecessor, the Atlantic Telegraph Company. Joint purse agreement with the French Atlantic Company. Gives of gross revenue: to Anglo-American Company, $63\frac{2}{3}$ per cent.; to French Atlantic Company, $36\frac{1}{3}$ per cent.
,,	Placentia and Sydney, 2 cables	 620		

* These cables are the property of the Post-office.

Name of Company.	Termini of Cables.	Length in Nautical Miles.	Date when Opened or expected Opening.	Remarks as to Connections.
French Atlantic (Société du Cable Transatlantique Française	Brest to St. Pierre, and St. Pierre to Boston	 3,333	July, 1869	
Cuba Submarine	Havaña to Santiago de Cuba	Batabano-Santiago . . . 540 (30 miles of land wire from Havaña to Batabano)	June, 1870	Connected with United States land wires and cable from Havaña to New York, &c., and with the West India and the South Pacific Companies' systems
Post-office . .	Holyhead to Howth . . .	 58		
,,	Shetland and Orkneys			
,, . .	Hebrides			
French Atlantic	Brest and Falmouth			
Eastern . . .	Gibraltar to Lisbon			
,,	Grecian & Turkish Archipelago			
German Union .	Lowestoft to Borkum			
Western Union, United States	Puerta Rosa to Key West, 2 cables; Key West to Havaña, 2 cables; Monte Video (just laid)			
West India and Panama	Santiago to Jamaica, Panama, Porto Rico, St. Thomas, Antigua, and other islands of the West Indies, to Trinidad and Demerara	Submarine . 2,640 (land wires, 350)	July or August, 1870	Working arrangements with the Cuba, and the Panama and South Pacific Companies, and intended arrangements with the Brazil Telegraph, for which a concession has been granted, June, 1870

Name of Company.	Termini of Cables.	Length in Nautical Miles.	Date when Opened or expected Opening.	Remarks as to Connections.
Panama & South Pacific *	Panama to Tumbez in Peru	Submarine . 1,100 (land wires, 30)	March, 1871	Arrangements as above, and with the Peruvian land wires, which continue the system to the Chilian lines to Valparaiso, and ultimately to Buenos Ayres
Falmouth, Gibraltar, & Malta †	Penzance, viâ Gibraltar, to Malta	 2,456	June, 1870	Working arrangements with the Anglo-Mediterranean, British Indian, British Indian Extension, British Australian, and China Submarine Companies
,,	Gibraltar and Lisbon . .	Duplicate		
Anglo-Mediterranean	Malta to Alexandria . .	Direct line . 900 line viâ Tripoli 1,160	October, 1868	Connected as above, and with the Marseilles, Algiers, and Malta, and Mediterranean Extension Companies
,, ‡	Malta to Alexandria . .	Duplicate line 906	1870	
Marseilles, Algiers, & Malta	Points named	Submarine . 862	August, 1870	As above, accommodating French interests
Marseilles . .	Algiers direct	. . . . 600?		
Mediterranean Extension	Malta and Sicily; Otranto to Avlona	About . . 110	November, 1857	British Government guarantees 6 per cent. interest
British Indian Submarine	Alexandria to Bombay . .	Suez to Bombay 3,600 (Suez to Alexandria (land wires 120)	April, 1870	Connected with Falmouth, and with Singapore, China, and Australia

* Not proceeded with.

† This Company, the Anglo-Mediterranean, and British Indian Submarine, form the continuous route to India popularly termed the Submarine Line.

‡ Not working.

Name of Company.	Termini of Cables.	Length in Nautical Miles.	Date when Opened or expected Opening.	Remarks as to Connections.
British Indian Extension	Madras to Singapore . .	Submarine . 1,800	In autumn 1870	As above, and with Indian Government land wires between Bombay and Madras
British Australian	Singapore to Batavia and Port Darwin	Submarine . 1,726 (land wires in Java)	In 1871	Joining the whole of Australia with China, India and Europe, and America
Tasmanian . .	Melbourne to Tasmania .	Submarine . 160	In 1870	Australian Colonial Line
China Submarine	Singapore to Hong Kong .	Submarine . 1,640	June, 1871	Arrangements with Companies to India and Britain, and with the Great Northern China Extension Company from Hong Kong to Shanghai and Japan
Great Northern .	England to Denmark, Scotland to Norway, Denmark to Norway, Sweden to Russia, Denmark to Russia	Total submarine . . 1,070 (Several land wires in Denmark, Norway, and Sweden)	September, 1869	In connection with the Russian Government land wires to Posietta Bay, on Pacific Coast, and with Great Northern China Extension Company to Japan, Shanghai, and Hong Kong, as above, and joint-purse arrangements with the China Submarine Company for section between Shanghai and Hong Kong
Great Northern, China, & Japan Extension	Posietta to Shanghai, and thence to Hong Kong	 2,300	In 1870	

Name of Company.	Termini of Cables.	Length in Nautical Miles.	Date when Opened or expected Opening.	Remarks as to Connections.
Indo - European TelegraphCompany	Crimea to Poti in Caucasia, along Russian coast of the Black Sea	Submarine . 300 (Land lines through Europe to Crimea, and from Poti through Persia to Teheran)	In 1870	Connects with the Indian Government cable at Bushire, which continues the line to India; and connected, through European land wires, with England viâ Submarine Company
Indian Government	Head of Persian Gulf to Kurrachee	Submarine . 1,200 (Land wires in Beluchistan and Persia)	In 1863	Worked by Indian Government in connection with Turkish lines from Busrah to Constantinople, and Austrian Frontier, &c., to England; connected also at Teheran with the Indo-European Company's route through Russia to England.
,,	Duplicate, Bushire to Jask	 500	In 1869	
Indian Government	Indian coast to Ceylon . .	About . . 70	In 1863	
British Government	Great Britain and Ireland, 3 cables	About . . 100	In 1853	
French Government	Spezzia to Corsica . . .	About . . 90	In 1856	
Spanish Government	Barcelona to Balearic Isles	About . . 250	In 1861	
Spanish Direct .	Falmouth to Bilboa			
		35,060		

The above list includes, it is believed, all the submarine cables which are now in working order, or which are in course of construction, and in a forward state, likely to be opened during this (1870) or the next year. But no account is herê taken of cables which have been laid, but have subsequently been taken up again or abandoned; nor of the numerous projected enterprises, some of which are likely to be ere long carried out; and amongst these are—the Brazil, about 4,300 miles, from Demerara along the coast of Brazil to Buenos Ayres; and the North Pacific, from the Russian Pacific coast at Posietta, viâ Japan, to Vancouver's Island and San Francisco, about the same length, completing, in Puck's words, "a girdle round the earth in (less than) forty minutes."

As we have before said, the Post-office authorities have no intention of purchasing these cables at the present time, with the exception of the strictly British lines to Ireland, and the cables to Landvoort and Norderney which formed part of the bargain with the Electric and International Company. But the day may arrive when, on imperial grounds, the Government will have these cables forced upon them by the interests of the nation, although, it must be borne in mind, that the risks and triumphs of these great submarine lines have been met and won entirely by private enterprise, and that except in one case (which was a failure) the Government has done nothing to assist the adventurers to whom it is so deeply indebted. The advantages of telegraphs are measured by the length of distance they

run. To all remote points the telegraph will practically supersede the post; it will link together all our military stations and establishments. At a day not very distant, the War Office must have its cable to every British military post throughout the world, as it now has to Aldershot and Chatham. The Navy department, in like manner, must have instant means of communication with its sea sentinels wherever they may be on the broad ocean. We cannot hope to hold together, in a military sense, our great dependencies, unless they are within instant call. The world is rapidly assuming a nervous energy it has never before known. When war comes, we shall be able to strike simultaneously from many points at once; and when peace arrives, we shall resume our mercantile activity throughout the globe the day the treaty is signed. It is impossible to suppose the Government will be able to restrict their control of the marvellous new agent to these islands, or that the country will permit it to forego its centralising power. This England of ours has a heart too large for its immediate body, and its vital force will only have full and sufficient play when it will be able to act and sympathise with her people in every quarter of the globe when occasion may arise. Taking this wide view of the necessity of the telegraph as a governing agent, we think we may assume that, sooner or later, all the cables running from these islands to our colonies and dependencies will fall under imperial control. What will they cost? the reader naturally asks, mindful that we have just purchased the home wires at six and a

half millions of money. What these ocean cables may be worth a dozen years hence it would be difficult to estimate, considering the rapid manner in which the world is being educated in their use, but we think we can give a very fair estimate of their present value.

If the submarine cables of Great Britain, which extend from her coasts to the adjoining coasts of Europe, to British North America, and to Gibraltar, Malta, India, China, and Australia in a continuous line, were to be purchased by the nation and worked by the Post-office, in connection with the system of inland telegraphs, it may be estimated that their actual cost has been about £6,960,000 on the following scale :—

Viz.: Submarine Telegraph Company . . .	£420,000
Anglo-American, 1,575,000 / French-Atlantic, 1,200,000 . . .	2,775,000
Falmouth and Malta	660,000*
Anglo-Mediterranean	260,000*
British-Indian Submarine	1,200,000
British-Indian Extension to Singapore .	460,000
British-Australian	660,000
China Submarine to Hong Kong . .	525,000
	£6,960,000

The Admiralty could render efficient service in the maintenance and repairs of cables in all parts, and through such an agency the Post-office department could maintain its cable property at much less cost than the several private Companies now owning them can do. We have excluded from our estimate all cables which, like the Marseilles, Algiers, and Malta, and the Chinese-Japan extension of the Great Northern

* Since increased.

Telegraph Company, are either chiefly for the accommodation of non-British interests, or are entirely out of British jurisdiction. But, on the other hand, as the Government threw the whole risk of these costly and hazardous experiments on private Companies, which are now reaping their reward in the shape of a very high rate of interest, the purchase of the submarine lines by the State would involve an outlay very far exceeding their original cost. In the home lines there was, comparatively speaking, no risk at all.

It was fully apprehended by the officers of the old Telegraph Companies that the transfer of the wires to the Government could not, in the nature of things, fail to produce some temporary inconvenience in the free working of their machinery. The best constructed engine heats in its bearings when started for the first time; what was then to be expected of a machine which had to be transferred from one department to another, and suddenly, without any preliminary trial, set in motion, with the whole community on the look-out for any shortcoming? Small complaints from the public were to be expected, but the fates seemed determined to harass Mr. Scudamore with more than ordinary perversity, perhaps by way of warning him against over-confidence. Scarcely a week had elapsed after the wires had passed into his hands, when, the first public occasion having arisen in which their use was required, a dead failure occurred. On Friday the 8th of February, just after the Queen's Speech had been transferred to the wires, a sudden paralysis seized

those connecting London with Scotland and Ireland and the principal towns in the north-west of England. The country papers were in despair. Those which had received the Royal message were cut suddenly short, without a word of the address, whilst others suddenly arrested her Majesty in the midst of her speech. It was as though she had been struck dumb in the presence of her whole people. "Magnetic disturbance," the cat of the telegraphic system, which gets the blame of all failings on the part of the wire, was freely debited with the disaster so inauspicious to the Government; but, on examination, a more material explanation of the occurrence was afforded. A workman in the hurry of the transfer of the wires to the new establishment, in some alterations he had to make in one of the local offices, by accident removed a bundle of wires which unfortunately happened to be the channel of communication between the Metropolis and the North and West. The effect was the paralysis, electrically speaking, of three parts of the United Kingdom. The mischief which caused so much surprise was set right immediately upon the discovery of the cause. Since that time the sister country, magnetically true to her old motto "England's adversity is Ireland's opportunity," has had an excuse for a fling at Imperial management by reason of the breakage of the Port Patrick Cable; this, together with the failure of the Wexford Cable, has afforded ample opportunity for complaints as to the treatment of our fellow-subjects across the water. We think Mr. Scudamore can afford to listen to these indig-

nant outbursts with complacency, as on the whole there can be no doubt that he has managed to take the reins with as little disturbance to the ordinary working of the telegraphic system as could have been expected. For the parting of a cable he cannot be held responsible. The only precaution that can be taken against its recurrence is to lay down duplicate cables to the different points across the Irish Sea; and this we believe will be done. These short cables, however, will give more trouble than those which traverse the Eastern and Western Oceans.

We cannot close this article without referring to what may be termed the public opening of the submarine cable to India, which was inaugurated at the entertainment given by Mr. Pender, the Chairman of the Company, at his mansion in Arlington Street, and at which his Royal Highness the Prince of Wales was present. It is a new idea, whilst holding high festival, to exchange courtesies, not as of old, with friends across the table, but with great Princes and high personages on the other side of the world. Mr. Cyrus Field has the credit of inventing this startling means of enlivening the ordinary chit-chat of the dinner-table, for at the banquet given in 1868 at the Palace Hotel, he induced the Electric and International Telegraph Company to bring into the room the wire in connection with the Atlantic Cable, and announced to the guests the compliments he was forwarding and receiving from his wife at New York, and the Governor-General of Cuba, and the President of the United States. Mr.

Pender, to whose commercial energy and financial aid we owe the laying of the sea line to our great Indian Empire at so early a date, was not to be outdone, and all England was startled to find by the *Times* of June 25th, that during the previous evening the Prince of Wales had been holding converse with the Khedive, the Governor-General of India, and the King of Portugal.

The services rendered by Mr. Pender to international telegraphy are not of a scientific nature, and there is, therefore, some danger that they may be overlooked; but they are nevertheless of so vital a character, that without them we believe the great submarine lines would probably not yet be in existence. It is, therefore, worth while to record them. After the failure of the Atlantic experiment of 1858, it became apparent that the cable had been ill-made and ill-laid. The public lost heart after the loss (as it was supposed) of £600,000; no more capital could be raised. Mr. Pender and a few of his friends persevered. They first bought up the two existing establishments for the manufacture of submarine cables, so as to insure the perfect construction of the article, and for that purpose Mr. Pender gave a personal guarantee of £250,000. This was in fact the turning point in the operation. The Company which was then formed to manufacture the cables also undertook to lay them; and thus, in conjunction with the new Anglo-American Company, a further sum of £200,000 was raised, and the line of 1866 was successfully laid by the Great Eastern, which they chartered for the purpose.

The Indian Government, under successive Ministers, refused to co-operate in the work of laying a direct submarine line to India. In 1869, it was resolved, by the same persons who had so powerfully aided the Atlantic lines, to raise the capital to do the work to India, without any further appeal to the Government. The British Indian Submarine Company was formed. Again Mr. Pender took the largest share of the risk; but he has been rewarded by a prompt and complete success. The wires are already laid, and on the 23rd June, Calcutta was in electric communication with his house in Arlington Street. The work will have been carried out at a cost of nearly £4,000,000, when it is extended to Eastern Asia and Australia.

We had finished our task, and this article was already in type, when we received a volume which we should have been happy to use if it had reached us a few days sooner, for it contains a complete narrative by Mr. J. C. Parkinson of the creation of the Ocean Telegraph to India. It is a volume of the highest interest, and it shows in conclusion that we are within a few months of completing the most extraordinary scientific and mechanical operation ever undertaken by man. The cable of the British Indian line, passing from Falmouth to Lisbon, Gibraltar, and Malta, has already placed England in direct communication with those harbours and with India. To this Mr. Parkinson adds, that—

"The British Indian Extension, the China Submarine, and the British Australian Telegraph Cables now in course of manufacture will next be laid in succession. From Madras a cable will be carried

to Singapore, touching at Penang. From Singapore one line will proceed north to Hong Kong, Amory, and Shanghai, and another south to Batavia and through Java to Port Darwin at the north of Australia. Thence a coast line will be taken round the north side of the Australian continent to Burketown, whence lines exist to Cardwell, Rockhampton, Brisbane, and Sydney, uniting with the telegraph from Sydney to Melbourne and Adelaide, and with that from Melbourne to Launceston and Hobart Town. From Hobart Town a cable is projected to New Zealand; and to complete the circle round the world, Mr. Cyrus Field and some American capitalists have been negotiating for another across the Pacific, from China to California, by way of Japan and Alaska. It may be assumed that by the end of 1874, England will be supplied with news not twelve hours old from every part of the civilised globe."—(*Parkinson's Ocean Telegraph*, p. 299.)

THE PROGRESS OF MEDICINE AND SURGERY.

A RETROSPECT of half a century in any art or science, in these days of rapid advance, gives us a striking indication of the rate at which it is progressing, and the life that is in it. Whilst, however, the gain may be patent enough to the initiated, the public, lacking any special knowledge of the sealed arts such as Medicine and Surgery, of which we are about to treat, although profiting by the general advance, can only estimate its progress generally. It is our purpose in the following paper to point out, step by step, the triumphs of the curative art during the memory of living men, indeed, during the active professional life of many of the present workers, in the great art of saving human life and of alleviating suffering.

It cannot be denied that as regards medicine, previous to that date, our methods of inquiry into the nature and progress of disease were very limited and defective. The physician, who had to deal with organs concealed from the observation of the senses, groped, comparatively speaking, in the dark. Our wonder is, indeed,

that treating maladies empirically, as they were obliged to do, they succeeded in even ameliorating diseased conditions, much less in repairing or curing them, as we know they occasionally did. Experience, unless it is founded on exact knowledge, where such a delicate machine as the human frame is concerned, is indeed of but little avail; and what intimate knowledge, we may ask, had our fathers of the minute structure of the human frame? or, what aids had they to help them in diagnosing the condition of a part when in a state of disease? Ask an engineer to give an explanation of the defective working of some complicated machine, placed in some closed and impervious cavity, and you ask the same seemingly unanswerable question that was put to the physician of the past century touching the human machine, a thousand times more delicate and complicated than anything that has been framed by human hands. Behind the chest and abdominal walls lay the whole mystery of life, with whose faulty working our fathers could do little more than guess at; for wanting the special arms of precision, with which we are now furnished, they could only work blindly in the dark, and get at the truth by *post-mortem* knowledge. Let us imagine the modern physician deprived of the tools he familiarly uses to diagnose the conditions of a part—the stethoscope, for instance. How utterly lost he would be: the heart and the lungs, the organs by which our breath and blood circulate, would be to him a closed book. All the delicate gradations of sound by which he knows as clearly as though he saw with his

eyes the exact departure of these organs from their normal condition and from their healthy functions, would be to him as though they had never existed. The surgeon equally was at a loss to discriminate the nature of pulsating tumours, and the condition of disease in arteries. The laryngoscope, again, enables the eye to penetrate down the larynx, and by the speculum insight is given into the uterus. By the still more wonderful aid to science given by the ophthalmoscope, we may be said to enter the very brain, and see, as it were on the index, the condition of the cerebral nerves and outer cranial circulation.

An entrance is gained in many directions into what to our forefathers must have appeared the impregnable citadel of the body. The enormous gain to the study of disease we have thereby acquired it is impossible to estimate. New instruments are leading to new trains of thought. They are teaching us how vain are many old remedies and forms of practice, a negative gain humanity should be thankful for. They are opening up new visions of the truth of which we formerly had no glimpse, and they are preparing the way to decisive triumphs, on the verge of which we may now be said to hang. If, however, we may congratulate the present age on these mechanical helps to scientific inquiry, we must not forget that they are but the necessary outcome of a previous growing knowledge. The time was ripe for them. Theoretical truths demanded to be verified by practical proof, which, by slow degrees, is being laid before us.

Neither must we forget to pay a just tribute to another instrument which supplies the very groundwork for all our just ideas of the ultimate anatomy and knowledge of the functions of the different organs of the human body—the microscope. By the aid of this wondrous instrument, the oxyhydrogen light records permanently, by means of photography, a whole world of facts of which we only formerly caught transient glimpses. The marvellously delicate organisation hereby opened up to the physiologist only fills him with deeper wonder than ever, at the delicate machinery by which life is carried on, and warns him of the rough handling nature has to fight against in the proceedings of practitioners of our yet imperfect art.

To recur, however, to the more practical portion of our subject, and dealing first with the surgical art, we may broadly state that its triumphs during the last half century may be said to be three—the use of Anæsthetics, Lithotrity, and Ovariotomy. But, although these may be said to be the leading points, yet we cannot conceal from ourselves that what are termed the minor points of surgery, which make little show, possibly confer by their wide-spread operations a still greater blessing upon humanity than the greater operations; but we shall have ample occasion to refer to these hereafter.

We shall refer—

1st. To the use of anæsthetics in the performance of surgical operations, whilst the patient is unconscious, or insensible to pain.

2ndly. To the invention of instruments by which a stone in the bladder may be crushed and washed away in fragments, instead of being cut out of the bladder whole.

3rdly. The removal of diseased ovaria.

To the late Sir James Simpson, of Edinburgh, is undoubtedly due the merit of having first introduced chloroform at Edinburgh as an anæsthetic agent. As early as 1831 its composition was made known by Sonkeren, and the next year by Liebig, but by these chemists the investigation was merely made as a part of scientific inquiry. The re-discovery by Simpson in 1847 was, however, entirely independent of these previous investigations, and its use as an anæsthetic was entirely due to the discrimination of the accomplished physician.

It may be said that there is no such thing as a perfectly new invention, a discovery coming fresh at once from the brain, like Minerva from the brain of Jove. There are always some antecedent movements in the same direction, some play about the central idea before the final step is taken, and this was the case with chloroform. As early as 1800 Sir Humphry Davy suggested the use of nitrous oxide gas, and indeed it was used in dental surgery by Dr. Evans, in Paris, and by Dr. Horace Wells, in Halifax, United States, in 1844. Sulphuric ether was also employed at Boston in 1846; but these agents were so inapplicable to the major operations in surgery, owing to their want of persistency, that they had no chance of establishing themselves as permanent agents in the annihilation of

human suffering, either whilst under the influence of the operating knife, or during the agony of ordinary disease. It is scarcely necessary to remark that the perfect quiescence of the patient whilst under any of the great surgical operations is a matter of the utmost importance, not only to the operator, but to the patient. The very fright and terror induced by the sight of the knife, and the anticipation of the coming trial, is sufficient to depress to an alarming degree persons of a highly nervous temperament, and especially those in whom any heart affection renders the possibility of shock highly dangerous. It is well known that pain and terror prolonged for any length of time is sufficient to cause death, independently of any ill effect from the operation. Instances are indeed common in the books, in which patients have died on the operating-table, before the knife has been used, from the terrible effect of shock. Even in the natural operation of parturition, when complications or obstructions have ensued which require the aid of instruments, death is not by any means an infrequent result of the exhaustion produced by the strain upon the vital powers; and it was to obviate these mischances that Sir James Simpson first introduced this powerful agent in ameliorating the pangs of labour.

Like every new art when first introduced, it was met by some of the profession with mistrust. The world had gone on, they said, for thousands of years without any interference with the physiological pains of labour; not only were they harmless, but necessary as a safe-

guard for the mother. In this instance, indeed, not only a certain portion of the medical profession set their faces against the employment of the new agent, but the clergy denounced it as a wicked interference with a divine decree: "To the woman he said, I will greatly multiply thy sorrow and thy conception; in sorrow thou shalt bring forth children." This sentence was quoted as a spiritual injunction, which at once set the fiat of the Almighty against the supposed unnatural interference with his will. We are all too familiar with similar outcries of the ignorant made against the discovery of Jenner in the last century, and which are still repeated to this day by the "peculiar people," who, under the influence of a crass fanaticism, suffer fine and imprisonment rather than submit to the law, which, in the interest of the individual as well as of the community, makes vaccination compulsory. The best answer to these absurd objections is to be found in the fact that chloroform has now been used in thousands of instances in relieving the pangs of maternity, not only without any evil effect, but to the relief of many of the ill consequences which follow prolonged labour-pains. In fact, anæsthenisation in midwifery is now the rule, instead of the exception. The extreme agony which the parturient woman has hitherto looked upon as inseparable to her condition is now by the aid of art, wholly abolished. In different surgical operations where time is required in dissecting away diseased parts, the gain to the surgeon is of equal importance as to the patient. We

may safely say that many operations are now possible that would not have been attempted before anæsthesia were employed. The requisite stillness and equanimity necessary for the performance of delicate and tedious operations, without their aid, could not have been obtained. For instance, excision of the jaw, of the scapula, and the shoulder-joint, would have entailed too much prolonged suffering to have justified any surgeon in such operations. Thus the discovery of the new agent may be justly debited with new methods of operations , especially in that new but beneficial art, so justly named by Sir William Fergusson—its principal originator—as Conservative Surgery.

But the use of chloroform has its drawbacks, and is in a measure supplanted by other and more eligible sister compounds, such as methylene. The public is indebted to Dr. Richardson for the introduction of this anæsthetic agent, which has been used by Mr. Wells, distinguished for his skill and successes in the operation known as ovariotomy, over five hundred times.

The second great operation of the past half-century must be deemed the brilliant one of lithotomy. Fifty years ago, upon the discovery of the presence of a stone in the bladder, the time-honoured operation of lithotomy, or of opening the bladder and withdrawing the stone whole, was the only method of cure for a most painful and, if neglected, mortal disease. About forty years ago the attention of surgeons in this country was drawn by Heurteloup and Costello to the simple expedient of crushing the stone by means of a peculiar instru-

ment passed into the bladder. Seizing with its forceps-like teeth and crushing the stone, sweeping out the larger particles with a scoop, and washing away the finer dust by means of an injected stream of water—the operation was so simple, as compared with the formidable application of the knife applied to such a sensitive organ as the bladder, that the very dignity of surgery seemed lowered by its introduction.

The fight between the lithotritists and the lithotomists became exceedingly lively, and in the clash of opinions the truth itself became clouded. Now, however, that time has cooled the heat of partisans, and the race of lithotomists who prided themselves on their manipulative power has passed away, and that Weiss has so greatly improved the crushing instrument, the great merits of the new operation have been finally accepted, and in no case would a surgeon propose the operation with a knife where the lithotritite could effect his purpose. It is true the operation for crushing is no longer considered so simple and harmless a procedure as at first; but the records of the two operations by the same hand show such a preponderating mortality from the use of the knife, that there is no longer any doubt as to the great gain that has accrued to surgery by the introduction of the modern mechanical process.

Sir William Fergusson, in giving his experience of the two operations, says:—

"I have personally treated 271 cases—162 by lithotomy, and 109 by lithotrity . . . . . of these 271, I have lost 47; and that shows a

mortality of something more than one in seven—not a bad average as operations for stone go; but lithotrity cases included, I consider it low indeed. And I have now to state that which I look upon as of high interest in the modern history of surgery. Of these 271 cases, 219 were adults; 110 have been treated by lithotomy, and of that number 33 have died; 109 have been treated by lithotrity, and of that number 12 have died!"

The advantage shown by these figures in favour of the crushing process is significant enough, but some manipulators may have given even a higher proportion of successful cases. Sir Henry Thompson, whose skill in this operation has become so notorious, could, we fancy, give more favourable evidence of the modern operation than the Sergeant Surgeon; but the evidence of one hand is of immense advantage, as it leaves no loophole for the argument that the advantage was due to especial skill. The question of the advisability of the use of an anæsthetic during this operation has been much discussed; but we much question if lithotrity would have attained to its present success in the absence of the pain-destroying agent, considering the extreme sensibility of the part involved, and the necessity for quietude thereby necessitated. By its aid the merits of the operation, when seen at its best, afford one of the greatest triumphs of the surgeon's art. It is, however, just possible that a still less painful operation may be the boast of the coming surgeon. It was proposed by the late Dr. Bence Jones to dissolve certain kinds of soluble stones by means of an electric current conducted into the bladder; and among the wonders performed by this new servant of man we should be by no

means surprised to find it performing this operation in a perfectly painless manner.

The operation of ovariotomy, which may be considered one of the most heroic operations now performed, must be looked upon, like many others we have to mention, as only a re-discovery of an old method of cure under better auspices, and in more intelligent hands. Until within these last fifteen years, the desperate nature of the wound made—really the Cæsarian operation, as regards the magnitude of the incision required—caused it to be virtually set aside by surgeons as unjustifiable, in consequence of the impossibility in many instances of successfully carrying it through after the incision had been made, and upon the high mortality attending its performance, even in the cases most favourable to the operation. In 1838 Mr. Lawrence denounced attempts to treat diseased ovaries by surgical operation "as dangerous to the character of the profession;" and the review of which Sir John Forbes was the editor, said that "whenever an operation so fearful in its nature was performed a fundamental principle of medical morality was outraged."

It was under these discouraging circumstances, therefore, that Mr. Spencer Wells began to perform the operation in 1858. At that time it had only been performed once successfully in any of our large metropolitan hospitals; and no case of complete success had ever occurred in Scotland. Yet now Mr. Spencer Wells' operations amount to more than 500; the mortality among the whole of the private cases

is 24·23 per cent., though in a series of 100 cases it was only 14 per cent., and the mortality on the total of Samaritan Hospital cases is 26·66 per cent. Dr. Keith of Edinburgh has been equally successful; and the late Dr. Tyler Smith, Dr. Bird, and others have also performed good service, and done their part in adding to the stores of our knowledge. The operation is now of frequent occurrence, and is recognised as perfectly legitimate. The remedy, it must be remembered, was imperatively demanded by the hopelessness of the disease, which gave rise to a dropsy which rendered the patient's life miserable, and which inevitably proved fatal. The temporary relief yielded by tapping could never be repeated many times, and these at short intervals, and then death closed the scene, often in young women just entering upon life. The boldness of the surgeon who revived the operation was only justified by his success. He may well be proud of the fact that hundreds of women, through his hand, have been saved from inevitable death, have recovered excellent health, and have borne children. Continental surgeons have been much struck by the admirable skill of the operator; and the compliment paid to him by Stromeyer, the great German surgeon, in a lecture delivered in St. Thomas's Hospital, that "Mr. Spencer Wells really, in this operation, had surpassed all living surgeons," was only deserved.

Last year Dr. Peaslee, of New York, published an important work in which he proved conclusively that "in the United States and Great Britain alone ovari-

otomy has, within the last thirty years, directly contributed more than 30,000 years of active life to woman; all of which would have been lost had ovariotomy never been performed." It is with pride and satisfaction that we can claim for our countryman, Spencer Wells, nearly one-third of this accrued life. Of his first 500 operations, 373 were successful. The average age of his patients was 38 years, at which age the expectation of life for a healthy woman in this country is 29 years. If no operation had been performed, 95 per cent. would certainly have died in less than four years; and it would be a very liberal allowance to say that the whole 500, if left to themselves, might have realised 2,100 years instead of the 14,500 naturally due to them.

If we calculate, then, the lives of the 373 women who recovered, minus the loss to the 127 who died, the total gain for the 500 patients is 8,817 years. The 373 survivors, however, secured by the operation the probability of the gross amount of 10,817 years of average healthy life, instead of the 1,492 years of miserable endurance which they might have passed before death without operation. Commenting on these conclusions, an able writer in the *British and Foreign Medico-Chirurgical Review*, says, "If on such a representation as this comment be necessary, and the tale fails to drive home its own moral, public feeling must be extinct, and the common intellect not worth appealing to."

It has long disparagingly been said that amputation

is the opprobrium of surgery, and the removal of a large portion of the frame on account of some disease or injury to the joint seems to justify the expression. Sir Charles Bell has written a charming essay upon the human hand, that most delicate and beautiful of all instruments. Sir William Fergusson justly descants upon the perfection of the human foot and ancle-joint, with regard to the perfect adaptability of their mechanism to the part they have to play in the human machine. Yet by the old method of procedure these perfect instruments were both ruthlessly and needlessly destroyed wherever there was a failure of the joint; that is, the infinitely superior portion of the human machine was sacrificed to what by comparison may be termed a coarse hinge. This wanton waste of so important a portion of the frame had, however, long struck an original mind. In the latter portion of the last century, when a vigorous flash of originality seemed to light up the annals of surgery, Park, of the Liverpool Hospital, may be said to have accomplished the first act of conservative surgery. His patient (a sailor, to whom the loss of a foot and leg would have been tantamount to the loss of his means of getting bread) determined him to make the experiment of simply excising the diseased part, the knee-joint, and retaining the foot and leg. This he did so successfully that, to use his own words, the patient, several years after the operation, "made several voyages to sea, in which he was able to go aloft with considerable agility, and to perform all the duties of a seaman; that he was twice shipwrecked, and suf-

fered great hardships, without feeling any further complaint in that limb." This was a crucial test of success that should have stamped the operation as one of the greatest surgical triumphs of the time; but, like so many other great strides taken in that age of extreme vivification, it was in advance of the age, and was destined to be arrested for the better part of another half century. Whilst the Liverpool surgeon thus showed the way to the preservation of the foot and leg, Moreau, in Paris, in 1797, following his inspiration, retained the arm and hand by simply excising the elbow-joint. These two splendid operations, which should have immortalised their originators, fell unheeded upon the profession, both at home and abroad. We can only account for this by supposing that the tremendous strain upon the human mind at this time, and indeed far over the threshold of the nineteenth century, caused a reaction in progressive surgery, as, indeed, we know it did in operative surgery in this country. Be that as it may, the operation has only been revived during the last twenty years, but is now fairly established. The elbow-joint section is now a matter of daily occurrence, but the knee-joint operation owes its striking success to our provincial surgeons. The success of Mr. Jones of Jersey, who has operated on a large number of cases with a percentage of cures far exceeding those in thigh amputations; the like success of Professor Humphrey of Cambridge, Mr. Pemberton of Birmingham, and Mr. William Clarke of Bristol, prove that the failures of the metropolitan

hospital surgeons in excision of the knee-joint are due to causes with which the dangers of the operation have nothing to do, and which we shall explain presently.

The conservative tendency in the professional mind in the metropolis for many years opposed a passive resistance to the knee-joint operation, which was strengthened, no doubt, by the many failures which occurred—not through the want of skill of the London surgeons, where, of course, the pick of the profession are to be found, but to the foul air of the hospital wards, which undid all that the most brilliant manipulative skill could accomplish. But against this resistance the splendid results in the provinces at length prevailed. It has been argued that at the best the patient has a stiff joint; but then it must be remembered that the limb, though stiff, is yet of flesh and blood, only so slightly shortened that a thick-soled boot or shoe makes up the difference. The foot and hand, with their infinite adaptability to human wants and necessities, remain intact. What an enormous gain this to the old method of amputation, which threw us back upon the bungling resources of art! We have little doubt ourselves that that miserable apology for the human extremity which those who suffer amputation are forced to submit to—the "Chelsea Pensioner," as the bucket and stump apparatus is termed—will become a curiosity, as far as the civil portion of the population is concerned; and that that hideous hook, which the old surgeons' handiwork needlessly necessi-

tated as a substitute for the ever mobile and delicate articulations of the hand and wrist-joint, will day by day become a thing of the past. Amputations of the leg and arm in war must, of course, be made, as there is no time nor opportunity for delicate surgery on the field of battle; but in the future, conservative surgery will without doubt save, in civil life, an enormous number of limbs that have been hitherto sacrificed.

The extraction of large diseased bones such as the scapula, or shoulder-blade, is another operation in surgery by which amputation at the shoulder-joint is obviated. This operation was performed in 1858 by Mr. Jones of Jersey. By means of this conservative operation, instead of a short stump the arm still remains, and is capable of motion, whilst the deformity is, comparatively speaking, slight.

In what might be considered the minor operations of surgery, the progress that has been made within the last half-century is very marked indeed. The resources of the surgeon in repairing the congenital failures of nature, and the accidents which flesh is heir to, are worthy of special notice. What malformation more disfiguring to the child than the hare-lip? Yet this deformity is now cured by simply paring the edges of the cleft, and bringing the raw edges together, with suture or spring truss, and nature speedily heals the wound. In cleft palate, the paring knife and a few stitches at once remedy deformity and change the voice and restore perfect articulation. Obliquity of vision formerly was deemed incurable; and when we think of

the number of people that used to go on squinting through the whole term of their natural lives, the brilliancy of Dieffenbach's * operation for its cure may be estimated. By the simple division of the internal rectus inside of the eye, strabismus as if by magic, is cured. Club-foot is treated now on a similar principle. The squint of the foot, if we may so term it, is caused by the extreme tension of a tendon, the cutting of which sets the foot straight. Stromeyer, who first performed the operation, thereby initiated a new method of surgery. By means of a sharp narrow-bladed knife, he makes a subcutaneous incision, by which the muscle is divided without exposing the wound to the air. This practice is of course available in numerous operations which go under the name of the subcutaneous incision. The very objectionable departure of the eye and the foot from their normal symmetrical position was thus at a stroke as it were set right by the almost dramatic application of the surgeon's knife. But a whole world of operations have been opened up, especially upon children suffering from contortion of limbs, either from congenital disease or from scrofulous affections, through this simple invention of the division of tendons. Poor wasters of humanity, tied up in knots, without power of motion, and utterly helpless, are daily transformed into passable specimens of men, capable of taking a part in

* This operation is now known by the name of this German surgeon, but it is as well for Englishmen to know that as early as 1823 Sir C. Bell performed the operation on a monkey successfully; it is really, therefore, the discovery of this great anatomist.

the games of their fellows, and of doing in after life their share of the world's work.

Indeed, the human face and frame is no longer condemned as of old to pass through life with congenital deformities, neither are the blemishes that arise in after life from accident or disease permitted to remain unrepaired. The well known advertisement of Madame Rachel, "made beautiful for ever," is a mere piece of profitable clap-trap; but what her cosmetics and washes failed to perform, those cunning in skin diseases accomplish every day, and in more serious deformities the surgeon's knife with a few intelligent cuts puts to rights. For instance, with the exception of some deformity of the eyes, there is nothing more blemishing to the human face divine than tumours of the jaw. To say that all normal expression is lost where they occur, is but a method of stating the case mildly. The repulsive character they give to the face, independently of the terrible discomfort they inflict upon the poor patient, is sufficient to make life a burthen to him. But the knife of the surgeon speedily sets matters right. The huge excrescences which thirty or forty years ago obliterated every feature, are now no longer seen. Tumours of a malignant growth on the face generally arise from some disease of the jawbones, and it was the practice of the early operators in removing this deformity to cut away the greater portion of these bones. With his mallet and chisel the surgeon set to work removing the diseased part, to speak roughly, just as a sculptor would correct deformity in his rough statue.

In these operations, performed some fifty years ago, more of the bony framework was removed than in the opinion of modern surgeons was necessary. According to Sir William Fergusson, only so much bone as is clearly diseased is removed. Here conservative surgery is truly applied, and the same effects are produced with far better expression. In these painful and tedious operations, in which such delicate surgery is involved, necessitating very careful dissections, the use of chloroform is of the highest importance; without the perfect quiet thereby induced, the removal of the diseased part, and the restitution of the face to its original delicate lines, would be impossible of accomplishment.

Whilst we are considering the means surgeons of late years have adopted for the obliteration of blemishes, we must not omit to mention the singular operation of skin-grafting, originated by M. Reverdin of Paris in 1869. We are all aware of the frightful scars, seams, and contortions which follow upon the healing of ulcers, involving sometines a large breadth of the epidermis, even when ultimately they repair themselves. The contractions which take place after severe burns often contort the limbs, and when the face is involved, eliminate every element of grace and beauty it may have originally possessed. When nature refuses to heal such wounds, the effect upon the constitution is very depressing, often indeed causing death. An operation which at once repairs the blemish and re-establishes the health must be looked upon as one of the most useful and beneficent triumphs of minor

surgery. As early as 1804 the experiment was tried by the Italian physician, Boromeo, of transplanting skin from one portion of a sheep's body to another, and the experiment was a success; but for some inexplicable reason it bore no fruit, and it was not until Reverdin conceived the idea that it passed into the domain of surgery. The difference between the original operation and that of the French surgeon may possibly have been the reason why it was not immediately fruitful. Boromeo transplanted a large flap of skin (just as a gardener would transplant a sod) from one place to another, an operation which was both painful and involved the making of one sore place to cure another. Reverdin, with a superior physiological instinct, merely transplanted small portions of epidermis, say a quarter of a square inch, or even less, on the raw surface, at about an inch and a half apart. These speedily took root, and spread from their centre, until these different little islands of skin met and made a continuous surface. The idea was first introduced into this country by Mr. G. D. Pollock, of St. George's Hospital, who has treated several cases by this method with admirable results. The only conditions necessary for success are that the skin shall be taken from a healthy person, and that it is placed upon a healthy granulating sore. By this method he has treated a large sore eighteen inches in length, and in a few months a healthy skin has been produced. When cicatrisations (as in this case) have contracted limbs, they are straightened by extension, and by this means

a permanent sore and a great deformity and lameness are removed.

Sir William Fergusson has stated in one of his lectures that surgical revivals are rarely attended with success (an assertion which we think is not borne out by the facts), and immediately gives an instance in which one at least has proved an important success of the day,—to wit, the treatment of aneurism by compression. We may here re-state what we have before asserted, that there is scarcely an operation that marks the great advance of surgery within these last fifty years that had not been tried in the previous half-century, tried and even succeeded; but, we suppose for want of favourable circumstances, passed out of the minds of practical men. Long since compression was used by Guettani and others; its renewal some thirty years ago by Dr. Hutton, of Dublin, may therefore be considered a mere revival; but practically it was a re-discovery. The success of his practice at once set the English surgeons upon the same track, and ligature of the artery is now no longer used where pressure sufficient to arrest the flow of blood into the aneurismal sac can be applied. Of late years even the method of pressure has been simplified. The application of an instrument is often injurious and painful, and only very lately the simple pressure of the finger continued two or three days, by means of relays of students, has succeeded in entirely arresting the flow of blood to the aneurismal sac, causing thereby coagulation and consolidation. The method of placing a ligature upon the

artery necessitated a surgical operation often of a difficult and dangerous nature, and formed one of the most striking operations of our great surgeons, the great Hunter included. Digital pressure, in accomplishing the same purpose, seems so simple and commonplace that the dignity of the operation would appear to suffer thereby; but this is altogether a mistaken idea. The surgeon who accomplishes his end by the most sparing use of the knife, or without its application altogether, is the true hero of his profession, and the greatest benefactor to humanity. As a still later example of what may be done by a simple method, we must refer to the very ingenious method adopted in 1860, in a case of popliteal aneurism situated beneath the bend of the knee-joint, by Mr. Ernest Hart. By simply flexing the knee and keeping it bent for two or three days, he effectually retarded the flow of blood in the sac, and made a perfect cure. This method has been adopted in nearly fifty similar cases by different surgeons since its first introduction, and it may well be considered a perfect triumph of conservative surgery. It is true that this method of treatment is only applicable to arteries situated in the inward bend of joints, but for these it must supersede the old method. The fact that it can be accomplished without keeping the patient in bed is in itself not the least of its merits. In this, among others, the graver operations are receding into the minor. Again, in hydroceles and serous cysts, instead of incisions and setons being employed, injections are now found to answer the purpose perfectly.

In compound fracture of the extremities and accidents to the skull, the active measures of the surgeon are now less than formerly required. Scrofulous bones are now treated by rest, diet, and cod-liver oil, instead of by amputation, issues, &c. On the other hand, many diseases once considered purely medical have been transferred to the surgeon. Ovarian dropsy, which not many years since ran its course hopelessly in the hand of the physician, is now cured in half an hour's operation by the surgeon's knife.

In cases where amputation is required great improvements have taken place of late years. The great desideratum in such cases is the production of "a good stump." Syme, and Perigoff, the Russian surgeon, have initiated new methods for accomplishing this object. The old circular method of operation had the disadvantage attaching to it, that after excision the muscles contracted and exposed the bone. In foot amputations, Syme retained the natural pad of the heel, and Perigoff improved upon this operation by retaining the heel-bone. In amputations of the thigh, Sir W. Fergusson's oval operation, and the flap operation, afford ample material for thoroughly covering the bone and closing up the wound.

Let us hope that in modern times no such mishaps will ever occur as were familiar to the elder surgeons, who in many cases on record removed limbs supposed to be diseased, and, when too late, found to their dismay that there was no local affection at all, the hysterical temperament of the patient leading him to believe, and

to convince his attendant, that mere neuralgic pains were symptoms of serious injury at the joint.

Next to the improvements in surgical operation, their after treatment must be considered. The scientific accoucheur has a well-founded hatred of what he terms a "meddlesome midwifery." A meddlesome surgery is fast becoming equally obnoxious to the intelligent operator. Within these last twenty years the clear sweep that has been made of the salves, the bandages, the lotions, the strapping, and plasters used by the elder practitioners, is quite refreshing. Surgeons are beginning to put faith in the healing powers of nature —a little lint and cold water, how excellent it is!

Sir William Fergusson with unmitigated contempt denounces these useless appliances in which the old school had so much faith. Referring to a patient sent to him from the country, suffering from the necrosis of a small portion of the clavicle, he says:—

"Now in this case the practitioner in charge had latterly trusted entirely to the supposed efficacy of a plaster of a waxy and resinous composition. So thick was it laid on (spread upon leather, and made to cover the clavicle, part of the arm, and scapula) that some considerable time was required, with a free use of turpentine, to clear all away, so that the part may be properly examined. It was then directly perceived that the only mischief remaining was a small bit of dead bone, which was almost as easily removed as lifting it from the table. The villanous plaster was discarded, water dressing was applied, and in a fortnight only a scar remained."

This was a very significant example of the value of the plaster to hide, not so much the wound of the patient, as the ignorance of the medical attendant.

Whilst the triumphs of surgery during the last half

century have been thus far undeniable, and human life, as far as the methods of performing operations are concerned, has been largely saved, and the old terrors of the knife have been absolutely annihilated, there has sprung up, we regret to say, a disease purely of man's creation, which has swept away the greater portion of the fruits of hospital surgeons' scientific advances; and were it not that we have it in our power absolutely to eliminate this new cause of mortality, we should indeed despair as to the value of our progress. The cause of the mortality we refer to is foul hospital air, the cause of more than half the deaths (to take a low average) that take place in our large metropolitan hospitals after the great operations. The investigations, instituted at the instance of Mr. Simon, the medical officer of the Privy Council, by Mr. Holmes, and Dr. Bristowe, with reference to the hospitals of the United Kingdom, have brought out this deplorable fact with a distinctness, in our opinion, which is indisputable; and the independent inquiry made by the late Sir James Simpson only strengthens us in this opinion, and leaves no appeal from the conclusion that must be drawn from them, that, according to the degree in which we aggregate surgical patients under one roof, rises the mortality of those who submit to operations in them.

These inquiries, indeed, only confirm what we have for a long time known as to the fatal consequences of confining large bodies of men in a small space, even when in a state of health. Indian barracks have for a

hundred years been telling us the same tale. The law has been forced to step in, and regulate the amount of air to each individual in emigrant ships, opening outwardly to the four winds of heaven ; yet we go on, year by year, adding wing after wing to our old hospitals, and building gigantic new ones for the reception of sick and wounded, totally regardless of the mortality that inevitably follows the crowding even of healthy people. In surgical wards of large hospitals overcrowded with beds, we have not only the same condensation of foul air, but the tenfold more deadly addition of poisonous effluvia given off by the disease, and especially by hospital fevers, such as pyæmia, erysipelas, &c., which hangs about the walls, is wafted by currents of air, from ward to ward, and is carried from patient to patient by the surgeons, students, and nurses in attendance, from those who have suffered amputations and have the fever so often following them, to those about to submit to operations which expose large wounds, and are consequently liable, in an extreme degree, to be infected by blood-poisoning. The morbific matter which hangs on the walls of hospitals can be removed by no known means of ventilation, and it has been found necessary at times to destroy them. When detached by accident, the floating particles may alight where they are least expected. They may sometimes be perceived by the smell at a distance of 500 feet along the corridor of a great hospital. Of course atoms that can be smelt can be inhaled. With these facts in view, we can give full credence to

the following table, which shows at a glance the increasing rate of mortality, occurring according to the size of the hospital, after the major operations in the metropolitan and provincial hospitals.

Size of Hospitals.	Death Rate.
1st Series.—In large metropolitan and British hospitals, chiefly containing from 300 to 500 beds or upwards, out of 2,089 limb amputations	855 died, or 1 in 12.4.
2nd Series.—In provincial hospitals, containing from 201 to 300 beds, out of 803 limb amputations	228 died, or 1 in 3.35.
3rd Series.—In provincial hospitals, containing from 101 to 200 beds, out of 1,370 limb amputations	301 died, or 1 in 4.4.
4th Series.—In provincial hospitals, containing from 26 to 100 beds, out of 761 limb amputations	134 died, or 1 in 5.6.
5th Series.—In provincial hospitals, containing 25 beds or under, out of 143 limb amputations	20 died, or 1 in 7.1.
6th Series.—In British private country practice, with the patients operated on in single isolated rooms, out of 2,098 limb amputations	226 died, or 1 in 9.2.

We know that these statistics, collected by Sir James Simpson, have been disputed; but, whilst we have no reason to doubt their accuracy, there is no necessity to swear by them. The table collected by Mr. Holmes and Dr. Bristowe gave a lower death-rate; but the decline in the mortality descends equally with the number of beds; hence the fact of the deadly effect of crowding surgical wards is clearly proved by the upholders and the denouncers of large hospitals. We have a corroboration of the assertion that mortality

greatly increases according to the degree of crowding in Mr. Spencer Wells' statistics with reference to cases of ovariotomy. Here the mortality per cent. descends from 76.92, in five large hospitals, to 26.66 in the small Samaritan Hospital, and to the insignificant figure of fourteen per cent. in private practice, where the patients are totally isolated in their own homes from all the danger of surgical wards.

With reference to cases of ovariotomy, Mr. Wells remarks in his valuable work that—

"The place where the operation is performed ought to be healthy, and, as time is generally at our command, there can be no excuse for putting or leaving the patient in an unhealthy house or district. If she lives in a healthy part of the country and can be treated there, it would be positive cruelty to bring her to an unhealthy part of town, or to expose her to the influences of a large general hospital. Even in the same town, or in the same district of large cities, better results have been obtained in private houses and in small hospitals, where the patient occupies a room alone, than in large general hospitals, where she must share a ward with other patients, and may be subject to the influences of dissecting students. In the fourth series of one hundred cases the mortality in private practice was only 14 per cent., while in hospital it was 31 per cent."

It may be urged—indeed, we know it is—that hospitals are maintained not only for the relief of suffering and the cure of disease, but as institutions for training future surgeons and physicians; that the larger the hospital the greater the number of operations, and more extensive the experience, and therefore the better teaching power, and the more convenient both to the teachers and pupils. This is a very plausible answer; but we question if it is well to urge it. We deny that patients' lives should be sacrificed to the best possible arrange-

ments for the schools. We feel certain that benefactors who pour in their thousands for the enlargement of these establishments would hold their hands if they knew that their beneficence would be expended in rearing magnificent establishments perfect in every respect, but with this unfortunate drawback to their perfection, that the larger they grew the larger would be the percentage of deaths within their walls, as compared with the smaller establishments!

Of one thing we are convinced: the hygienic condition of these great hospitals must either be wholly revolutionised, or the performance of dangerous operations within their walls must sooner or later be abolished. With the exception of accidents, which require immediate attention (and even these would be treated much more safely in their own homes), we see no reason why all the large hospitals should not have cottages attached to them, either in their immediate neighbourhood or within easy distance in the country by railway. St. George's Hospital has, indeed, such an establishment at Wimbledon, where all cases of ovariotomy are treated. Possibly this is only letting in the thin end of the wedge. We trust it may be so, and that the great West End hospital may have the honour of taking the lead in an inevitable reform; otherwise we cannot see why this particular operation should be made an exception to others equally dangerous.

The spread of cottage hospitals throughout the country, no doubt, will do much to modify the present unsatisfactory state of things. At present the cases

that have the least chance of recovery from an operation in our foul metropolitan hospitals are agricultural labourers, now so liable to injury by reason of the increase of steam machinery in husbandry. Sending these poor fellows, after injury, to London, or some of the great provincial hospitals, for the "best advice," is tantamount to signing their death-warrant; whereas they would stand a chance of making a good recovery, if treated in their own homes or in cottage hospitals.

The most marked and singular change which has taken place in the practice of medicine is the utter abolition of the use of the lancet. Fifty years ago phlebotomy was universally practised in the majority of diseases, and the bleeding-shop was one of the institutions of the country, and was visited in the spring and fall of the year by the people even in good health, "to be blooded." There seemed to be a popular idea abroad among the people that they could not have too much of a good thing, and that they required a periodical hand at the pump to keep them from foundering. Medical men seemed to have inherited this popular delusion—at all events, their practice was founded upon no scientific data. Now that indiscriminate bleeding has utterly passed away in England, we can only wonder at the astounding drain of blood that was empirically taken from the people, and speculate upon the mortality it occasioned when resorted to on improper occasions, as indeed is still the case in some other parts of Europe, especially in Italy and in Spain. In Italy a host of illustrious persons, including Cavour

and several members of the Royal Family, have fallen victims, even recently, to the use of the lancet.

Some of the records the surgeons of the last generation have left behind them only make us shudder at the blindness with which, in defiance of its evil results, the use of the lancet was persisted in. Dr. Markham, in his "Change of Type in Disease," referring to this infatuation, gives the following examples of the practice:—

"I remember (says Dr. Stokes) when I was a student of the old Meath Hospital, there was hardly a morning that some twenty or thirty infatuated creatures were not phlebotomised largely. The floor was running with blood; it was difficult to cross the floor of the prescribing-hall for fear of slipping. Patients were seen wallowing in their own blood like leeches after a salt emetic."

"Dr. Rush tells us ninety ounces were often at one sitting taken from his friend Dr. Dewes, and of course with advantage. Dr. Dewes, again, on his part, took eighty ounces from a delicate woman in puerperal convulsions; and from another young woman, under similar circumstances, 120 ounces, within five or six hours, and twenty ounces more on the next day. The patient lost her sight for a fortnight, and did not recover her health for six months; '*but do not*' (says Dr. Clutterbuck, who tells the tale to his students) '*harshly conclude that this loss of blood caused the blindness; a much more natural cause is to be found in the affection of the brain which caused the convulsions!*'"

We could go on for pages giving examples of the blood-letting mania which infected the old practitioners, and of the persistency with which they ascribed the ill effects to other than the cause they themselves were supplying. We are compelled to say that nothing in the practice of physic is so humiliating to the reasoning physician of the present day as these dreadful examples of the unwise use of the lancet. The reason

given for the almost sudden abolition of this instrument is as unreasonable as the practice. It was asserted that the atmospherical conditions at the time of the first advent of cholera, in 1830, produced such an asthenic type among the population—in other words, such a state of debility—that bleeding could not be borne! As we have not again rushed into the old practice, we must conclude that this sudden advent of debility is persistent! To such miserable conclusions haphazard after-thoughts sometimes bring us. Not only is the lancet banished from England, but from Germany and France we hear from Dr. Stromeyer that it has disappeared. That a debilitating influence should have simultaneously overspread Europe is so absurd, that we can only smile when we hear it put forth as the cause of a change in treatment, which, indeed, was due to the good sense of the public.

Like all sudden reforms, however, it went a little too far. There are diseases in which bleeding is undoubtedly efficacious; but although some physicians, like Dr. B. W. Richardson and Dr. Stromeyer, more independent than their contemporaries, insist upon the advisability of resorting to the lancet on certain occasions, there seems to be no probability of the profession reviving the practice generally which seems to them dead.

Among the medical discoveries of the last thirty years, the affection known as Bright's Disease may be considered as the first. This is a form of kidney disease which generally proves fatal, and the method

of diagnosis is one of the triumphs of pathological chemistry, which shows itself in a very dramatic form. A very small portion of the urine placed in a test-tube, by the application of a drop of nitric acid, or the mere application of heat from a spirit lamp, affords sufficient proof, in nine cases out of ten, to seal the fate of the patient. The presence of albumen is by either of these tests immediately made evident, and the constant drain of this essential element of the blood is mortal. A little coagulation of the contents of the test-tube, and the physician knows that the days of the patient are numbered. The microscope, with its searching eye, again finds out death at a glance, often where it was quite unsuspected. Certain unmistakable appearances in the lens show that cancer is present in the tumour the surgeon has removed with his knife.

The greater accuracy of our diagnosis, consequent upon new instruments, which search into every cavity of the body, is day by day giving us clearer views of disease, without which our remedies are often vain, sometimes indeed prejudicial. Dropsies of the chest were often confounded together; the same may be said of those of the abdomen. The former are now known to be but the sequela of heart disease, whilst the nature of the latter can easily be discovered by the stethoscope and simple percussion.

A new instrument has only just been discovered—the diaphonoscope—by which the internal organs are made visible through the walls of the abdomen by means of very powerful lights, which render the body

to a certain degree transparent, and the outlines of the abdominal viscera are thereby mapped out to the eye. It is impossible to say at present of what value this new instrument may be as a diagnostic agent. When the ophthalmoscope first came before the profession it was rejected by a leading ophthalmic surgeon as a mere "useless toy," whereas it is now recognised as of the utmost value. By its aid we can discover the condition of the cerebral circulation, and the condition of the optic nerve. Not only in diseases of the eye its value is great, but it has become a necessity of the physician in brain diseases. Epilepsy, and that terrible malady general paralysis, and even Bright's Disease, can now be diagnosed by looking into the eye with this instrument at the optic nerve, and the beautiful reticulations of the arteries which are seen on the optic disc. The "useless toy" answers many questions as to what is going on in the brain, which before we could only darkly guess at.

Possibly the greatest advance that has been made in the last century is with respect to the physiology of the nervous system. To two men are due the unravelling of the action of the nervous centres—a discovery, according to Stromeyer, as great as that of the circulation of the blood. Sir C. Bell, by careful dissection of the roots of the nerves, discovered that those of motion and sensation were quite distinct; and this discovery gave rise to the still greater advance made by Dr. Marshall Hall, and the unravelling of his scheme of the reflex action of the spinal cord, by

means of which he showed us how all the functions of the animal economy are performed independently of the will. Before the time of these great physiologists we were quite in the dark as to the beautiful machinery by which the functions of life were carried on, perfectly unconsciously to ourselves. We knew not why, when the light fell upon the eye the pupil contracted, and when a still greater illumination fell the eyelids closed to shut it out altogether; why the fauces grasped anything placed within its reach; or why even in sleep the hand immediately moves away any object that may be irritating the skin. The reflex action of the nervous system at once furnished a clue to many obscure pains that had been treated locally, but which might have resulted from the altogether unsuspected irritation of some internal organ. To British science alone the world has to be grateful for the unravelling of the working of the nervous system, which to our fathers was only a tangled web, of which only the thread here and there had been caught and traced. To the two physiologists we have mentioned alone the glory belongs; and we question if even the great discoveries of Harvey and Jenner surpass the value of the clue they gave to the manner in which the nerves act upon the body.

The tools with which the medical man works have also been marvellously improved even within these ten years. We are not now alluding to the instruments by which he finds out disease, but the medicines with which he cures them. This is a matter in which the

patient is directly interested. We can all remember the nauseous drugs with which we were dosed, say some thirty years ago. The woody fibres we were forced to swallow, the gritty substances we could not swallow, the powders which never could be washed out of the mouth! Not only were they dreadful in quality, but the quantity was appalling. Both the physician and the general practitioner must share the blame as regards the excess with which they were supplied. A prescription of a physician of the old school was a dispensary in itself. The countless ingredients, the action of which under the effect of the gastric secretions were often of a conflicting character, without doubt produced symptoms that puzzled him as much as the patient. The tendency in the present day is in the other direction. A wiser instinct has taught simplicity; indeed there is a growing reliance upon what we may term natural medicine, instead of mere medicaments. Change of air, water, and scene, the influence of the mind upon the body, now enter largely into the repertory of the physician. He is beginning to see that many curative agents are required to set his patients up in health again, inasmuch as many have been the cause of casting him down from it; and he practically admits that these agents require to act through a longer space of time. Hence extended holidays and prolonged travel, which increases the health even of the most robust.

The general practitioner, dealing with what we may term the middle-class strata of the population, has

been moved to a reform by another motive, which is quite as potent as the scientific one. The habit of charging his time has taken the place of the old abominable practice of simply sending in his bill for medicines supplied. It is true this great reform applies more to towns than to the country, where the medical man is obliged to act as chemist as well as doctor; but even when he is obliged to dispense his own medicaments, the habit is growing of charging rather for his skill than for the number of bottles he crowds upon his unhappy patients. We think there can be little doubt that the practice of homœopathy has had something to do with this change. When a certain enthusiastic class of the population took up this new doctrine, and it was seen that by perfect abstention from physic (for the infinitesimal doses given practically amounted to this), the patients, in the majority of cases, where some simple derangement of the system existed, got well; the lesson taught was twofold—in such cases the curative value of drugs was of secondary importance, and the power of the mind over the body was the primary cause of cure. Faith in the physician—what a power it is! and he who can command it may throw much of his physic to the dogs. Nevertheless faith stops short of actual bodily derangement; it will not stop an ague-fit, or cut short a fever; it will not set the lung of the consumptive patient to rights, nor give motion to the paralysed arm. In such cases where destruction of vital parts has ensued, the mere mockery and snare of the homœ-

opathic theory is at once apparent. And here the specific value of certain drugs discovered during the last half-century steps in to restore the balance to the orthodox practitioner. Among these may be found first and foremost cod-liver oil, that has stayed the hand of the destroyer in many a patient that would otherwise have succumbed to pulmonary disease; iodine, gallic acid, and hydrocyanic acid have proved of great value; and last, but not least, we credit the medical profession with the introduction of electricity as a most potent agent in rousing the vital powers of the system. Day by day its potency in reviving the failing nervous system is becoming more apparent. Faradization, or the passing of the constant current, is the best stimulant known in rousing the paralysed limb, and in cases where the heart's action has stopped, the current has once more set the machine of life going. By the hydrate of chloral, on the other hand, overaction of the nervous system is met and checked, and all the evils of opium—sickness, constipation, and headache—are avoided. But in addition to these actual additions to the agents by which the physician fights disease, we must allude to the much more effective and scientific method in which he applies them. The modern discovery of the alkaloids, or the active medicinal principles of our vegetable materia medica, is very important. Instead of coarse bark that used to choke us when we were attacked with ague or weakness, science now presents us with the elegant quinine. Instead of the nauseating dose of jalap an infinitesimal portion of

jalapine is far more effectual, and morphia with a drop seals up our senses, where the larger dose of opium defeated its object by refusing to remain upon the stomach. Even the mode of action of this drug has been greatly improved of late years. In cases of neuralgic pains and spasmodic agonies subcutaneous injection of the drug now acts at once effectually upon the local affection, without our having to go the round-about way to give a cure through the system generally. Sir James Simpson has, we think, very shrewdly suggested, that the principle of rapidly affecting the whole system, on the other hand, by means of the wide-extended blood surface of the lungs, may not be far off.

"If it is ever (he says), for instance, a matter of importance, in some inflammatory or other ailments, to affect the system rapidly and fully with mercury, why may not the chemist discover some gaseous and respirable form of mercurial combination, the inhalation of which should salivate in as many hours as days are now required for the induction of that effect?"

His own discovery of chloroform has indeed shown us the potency of the lung form of administration, and why other medicaments may not be in the same way employed we do not see. As Watt said of the application of an old invention to perform some new office, it would only be employing "a knife to cut cheese that had previously cut butter."

Among the greatest improvements in the treatment of the reason may be considered the removal of lunatics from the larger asylums to smaller abodes, where they

have the benefit of a more cheerful mode of life and better air.

"I have (says Dr. Bucknell) recommended the erection of an inexpensive building, detached from but within the grounds of the present asylum, in preference to an extension of the asylum itself. My reasons for this recommendation are, that such a building will afford a useful and important change for patients for whom a change from the wards is desirable. The system of placing patients in detached buildings, resembling in their construction and arrangements an ordinary English house, has been found to afford beneficial results in the so-called cottages which this institution at present possesses. *These cottages are much preferred to the wards by the patients themselves, and permission to reside in them is coveted.* I am also convinced that such auxiliary buildings can be erected at a much less expense than would be incurred by the enlargement and alteration of the asylum itself. I propose that in the new building the patients shall cook and wash for themselves."

If those who devise these vast establishments would only study human nature and the English character, they would not be surprised at these cottages being preferred to the tyranny of the big houses. Those who are harmless and hopelessly insane need not even the protection of the asylum walls. They are now very judiciously drafted back to their own unions, where, in the comparative freedom of the "house," they pass the last year of their lives happily, and at a diminished cost to the rates. Here, again, we can see a return to an old state of things, but with better safeguards to the good treatment of the patients than our forefathers insisted upon. There is a moral infection in asylum air, which depresses and injures the patient, as much as the fever infection injures the inmates of the surgical wards of the great hospitals. Isolation in both cases is the best treatment. Healthy minds surrounding the

one, are as much required as pure air for the recovery of the other.

In the colony of Gheel, in Belgium, the harmless lunatics are placed in cottages, and live the life of the people—a people trained by hereditary habit to treat them properly. Here they labour in the fields, live with their hosts, play with the children, and partake of the joys and the sorrows of the household. In this village, or combination of villages, the purely medical treatment is under the control of medical inspectors. There is perfect freedom, and we question if the runaways are as numerous as from any of our large asylums. Our Commissioners are with faltering steps making advances towards the primitive state of things, which puts as few impediments as possible in the way of the recovery of the patient, and which gives the lunatic mind the surroundings and support of healthy minds —the true psychological medicine when judiciously applied.

We see with great pleasure that the Scottish Commissioners recognise the advantage of giving more freedom to the pauper patients suffering from chronic mania. When possible, they are transferred from asylums and workhouses, and sent to reside with the labouring classes in the country villages. Kennoway, in Fife, may be said to be growing into a Scottish Gheel, as the village is becoming peopled with the incurable insane. So far from the freedom of the new life acting to their disadvantage, it has proved quite the contrary. Patients who are noisy in the asylums

from which they were removed, have actually become quiet in the homes of the cottagers, and two patients, who were considered hopelessly insane, have recovered after experiencing the mentally bracing effect of a cottager's life. We trust the example will not be lost upon the English Commissioners.

But the improved treatment of the insane has been helped on in this country by a better knowledge of the disease itself. Mind being now considered an emanation of the body taking place through the nervous system, and its derangements merely the results of nervous disease, the speciality is merged within the broad scope of medicine, and the intelligence of the whole profession is being gradually brought to bear upon it. As a necessary consequence an enormous increase of experience is the result, and the unity of bodily and mental disease and their effects one upon the other demonstrated. Neither must we forget the courageous manner in which, directly in the teeth of public opinion and the feeling of the bar and the bench, Dr. Winslow may be said to have practically inaugurated the plea of insanity in criminal cases. It may be said that he took inspiration from the saying of the great Pinel, "One of the great objects of my life shall be to demonstrate to the judges of the land that numbers of persons brought before them, found guilty, and convicted as criminals, were only insane." Dr. Forbes Winslow not only fully believed in this doctrine of the great French psychologist, but brought it to bear on the public judgment seat. In the celebrated trial of Mac-

naughton for the murder of Mr. Drummond the banker, in 1843, and on several occasions since, he has urged the plea of insanity successfully, and saved many poor creatures from judicial murder. In the case of Macnaughton the whole press of the country were full of gross abuse of this physician for daring to urge this new-fangled plea, while cheating the hangman of his victim. Yet this man, after many years' confinement in Bethlehem, died a miserable lunatic! In the case of Albert Victor Townley, again, who was convicted of the murder of his sweetheart, the same plea was urged by Dr. Winslow, and after he had been sentenced to be hanged, some misgivings as to the justice of the sentence induced the Home Secretary to send down a medical Commission to test his sanity. It came to the same conclusion as Dr. Winslow. So furious, however, was the public for his death, that it would not admit the plea of insanity. A second Commission of medical experts reversed the decision of the first. Townley, however, was saved from the gallows, doubtless through some pardonable misgiving on the part of the Home Secretary, and was consigned to penal servitude for life, which he ultimately forfeited by his own act, thus fully justifying, not only by this act, but by his conduct in prison, the plea of insanity urged on his behalf. In the case of Mrs. Vyse, who was convicted of murdering several of her children, Dr. Forbes Winslow, in conjunction with the late Sir Charles Hood, M.D., successfully urged the plea of unsound mind, and the plea, at first thought to be such an outrage upon common sense, has become not only

familiar, but is considered a merciful plea, and is tacitly admitted even by the judges who have condemned prisoners to death. Could any more significant proof of this be adduced than the case of Christina Edmonds (the poor creature whose belongings were saturated with insanity), who was declared by the judge who tried her, to be justly convicted, who withstood the plea of insanity as being unsound, and nevertheless saved her life by recommending her to the mercy of the crown? Now that the battle is won, and the merciful plea stamped as legitimate in every court of justice in Europe, we must not forget those who bore the heat and burthen of the day.

It is hardly necessary for us to point out, when speaking of the advances made during the last fifteen years in our knowledge of the nature and treatment of mental diseases, the great impetus that was given to the subject by the establishment in this country by Dr. Forbes Winslow of the *Journal of Psychological Medicine*. This was the first periodical in connection with the psychology and pathology of insanity that appeared in England. Dr. Winslow edited this quarterly journal for seventeen years. He is also entitled to the credit of having written the first English *medical* treatise on self-destruction, entitled "The Anatomy of Suicide;" and there can be no doubt that, considering the number of works that have issued from his pen during the last twenty years, he fully deserves the handsome encomium which the *Lancet* has passed upon him, that he has, "by his writings, given a great

impetus to an enlarged and liberal study of the philosophy of insanity, cerebral pathology, and medical psychology; and has contributed more than any other physician of his day to the dissemination of an improved, humane, enlightened, and curative treatment of the insane."

Dr. Maudsley, in one of his thoughtful Gulstonian lectures, has written an admirable chapter on the special psychological expression of different diseases, and has shown that "the internal organs are plainly not the agents of their special functions only; but, by reason of the intimate consent in sympathy of function, they are essentially constituents of our mental life." The heart, the lungs, the liver, and the reproductive organs, when diseased, have their voice, if we may so speak, in the varying emotions which they give rise to.

The wonderful exaltation of hope which takes place in the consumptive patient we are all familiar with. The fear and oppression which accompanies heart disease, and the depression and envious feelings which master us when subject to derangement of the liver, have long been patent to the poet as well as to the physician. To a still larger extent sex influences character, and it is in the power of the surgeon to wholly change the tone of mind of either man or woman. With proofs like these of the solidarity of mind and matter, we need not fear that the study of psychological medicine will in future be hampered by the subtleties and words of the metaphysician, but confidently expect that it will become amenable to scientific inquiry as a purely physical disease.

In a chapter on "Conscience and Organization," * Dr. Maudsley has carried the physiological method of inquiry to a startling extent, by claiming for it the establishment of the doctrine that conscience itself is a function of organization—that there is, in fact, the same essential connection between moral sense and brain which there is between thought and brain, or between any one of our special senses and its special ganglionic centre in the brain.

In the foregoing pages we have shown how much mankind owes to medicine and surgery, and we cannot conclude without asking what has medicine received in return from the State? In France, Germany, Russia, Italy, and Spain, honours and rewards from the nation await the men who are useful to their country. In England it is certainly most unjust that while national honours are heaped upon those who have distinguished themselves by military courage or political talent, no public recognition beyond a baronetcy is given to men who have been pre-eminently benefactors to humanity. A tardy and insufficient tribute has, it is true, been paid to the discoverer of vaccination; but there live at this moment men in the profession of medicine who have done as much to deserve public gratitude as did Dr. Jenner. There are great men who have robbed operative surgery of half its horrors by abolishing its pain, and there are those who have manfully overcome every opposition which prejudice threw in their way, and

* "Body and Mind." Second Edition.

have triumphantly rescued one disease from the black list marked incurable. We believe these men are themselves sufficiently repaid by the inward consciousness of having been permanently useful to their fellow-men, and of having added to the sum of human knowledge. But for the sake of others, and especially for the sake of those still hesitating as to the profession which they will embrace, it is extremely desirable that some tangible evidence should be given that the nation appreciates the sacrifices daily and hourly made by those who devote their energies and their talents to the promotion of its physical well-being.

THE FOUNDLING HOSPITAL, IN PAST AND PRESENT TIMES.

Captain Coram, the benevolent founder of the Foundling Hospital, tells us that the good thought came into his head of rescuing poor deserted children from death, in consequence of the number of new-born babes he met with exposed on the highway in his daily journeys from Rotherhithe to the City. It is, of course, to be remembered that that suburb was a far wilder place then than it is now: but that does not alter the fact that it was, according to the old mariner's testimony, so common a thing, that it smote his compassionate heart, and led him to devise some means to put a stop to it. This was in the beginning of the last century, when life was taken very lightly, both legally and illegally; and it the more redounds to the credit of the weather-beaten sailor that he should have risen superior to the morality of his age, and should have gone so much out of his way to preserve life, when society constantly took it.

The old captain—all the world knows his bright, cheerful face, from Hogarth's splendid portrait of him exhibited in the International Picture Gallery of 1862

—although he had consorted with rough men all his life, knew when occasion came how to enlist the other sex in a good work. Through his persistent energy and their aid, he obtained a Royal charter of incorporation in 1739. At first the charity was established in Hatton Garden, at that time as closely built as it is now; but two years later the governors purchased fifty-five acres in Lamb's Conduit Fields—then entirely open—of the Earl of Salisbury. Land then was not worth as much as it is now in the metropolis; ten thousand pounds an acre is a common price in the City, and by no means in the most valuable part; then it was thought a good bargain by the earl to get five thousand five hundred pounds for fifty-five acres, or seventy-five pounds an acre. What would the North Western Railway have given for such station room thirty years ago? The building, which has an imposing appearance even in these days of imposing structures, was finished at different times. The west wing was first opened in 1741, the east wing a short time afterwards, and the chapel, which connects the two, was built last.

Like many other founders, Captain Coram discovered that when his idea became a fact, others stepped in to take advantage of it. The first twenty children who were admitted, came in under the following regulations:—In the first place, no child was to be admitted above the age of two months, or with contagious disease. The next regulation was not so harmless. The person bringing the child was directed to come in at the open gate, and after ringing a bell at

the inner gate, was to deliver the child, and not to go away until it was either kept or returned. No questions were to be asked of the person bringing the child. These regulations opened the door to all kinds of fraud; many of the children so deposited were not true foundlings at all, in the legal sense of the term: every woman, married as well as single, who thought she could throw the maintenance of her child upon the charity, of course flocked there, and the idea of Coram —which was to reclaim the erring mother, as well as to preserve the child—was grossly perverted. The scenes at the door of the Foundling became scandalous; mothers fought for the first chance of depositing and getting rid of for ever, the being that maternal love should render dearest to their heart. Under these circumstances, Captain Coram withdrew from the institution. It is pretty clear that a job was intended from the first by the governors. They wanted to create a vested interest, to found a large asylum, to be nurtured by the State, and rendered capable of all the abuse to which such asylums in those days were but too prone. They knew the king was favourable, and they obtained a parliamentary grant. Having thus the command of the public purse, they opened the institution to the entire kingdom. So anxious were they to sweep up all the illegitimate and legitimate into their net, that they opened depôts in all parts of the kingdom for their collection, and in order to insure their arrival in safety, a new branch of the carrying trade was instituted. But as the carriage was prepaid, and sometimes very

handsomely, the carriers were justly suspected of dropping them on the way, to save all further trouble, and in all cases they grossly neglected them, and the mortality was of course enormous. These tender little ones, under two months old, were packed in baskets, and it is on record in the journals of the House of Commons, that one carrier, happening to get drunk, fell asleep on a common, and three of the little ones were, of course, sacrificed to the cold night air. They were even brought, like York hams, in the stage waggons, and often the whole number perished on the way. The poor-law authorities, of course, took advantage of the institution to relieve the local rates. Many of these little babes, who came of rich parents—and the number pointed to the lax morality of the age in all classes—were richly dressed. This led to their clothes being stolen on the way, and they were often put into the basket at the gate as naked as they were born. On the first day of this general reception, no less than one hundred and seventeen children were deposited in the basket. Up to the year 1757, the infants were distinguished by no mark by which they could be recognised, and as no questions were asked respecting them of the carrier, grave suspicions got about that many of them were wilfully murdered. A person was actually put upon trial for infanticide, and would have suffered death, had he not been able to prove that he had delivered the little one alive to the carrier. However, the outcry became so loud, that in that year it was decided to demand a token with the little one, in order that it

might be identified and reclaimed if the parent wished to do so on a future day. There was one method of identification, although it was not a very satisfactory one, and that was a description of the child's dress. One or two of these descriptions we take from the records of the Foundling, and they would seem to point to the fact we before hinted at, that classes took advantage of the Foundling for whom it was not intended. Here is one extract under date 1741 :—

"A male child, a week old. A Holland cap with a plain border, edged biggin and forehead cloth, diaper bib shaped and flounced, dimity mantle, and another Holland one. Indian dimity sleeves, turned up with stitched Holland, damask waistcoat, Holland ruffled shirt."

It is pretty clear this child was the offspring of no poor betrayed creature ; indeed, some of the accompanying scraps that about this time came with the children show quite clearly that the Foundling was prostituted to the worst of purposes.

"This child is the son of a gentleman and lady of fashion. You may assure yourselves that the moment some circumstances will admit (which, for the honour of both, is and must be at present a secret), it will be taken away, and this noble foundation be remitted all their expenses. You are requested to call it (if agreeable to your rules) Frederick. It is not to be doubted that the utmost care will be taken of it.—Yours, etc.

"N.B.—It is not christened."

The door thus indiscriminately opened by Parliament, the reception basket could scarcely ever have been empty. In less than four years, fourteen thousand nine hundred and thirty-four babes were admitted. Of

course, but few of these could be well nursed, and the consequence was a mortality of no less than seventy per cent. This was indeed turning Coram's humane institution for the preservation of life into a terrible instrument of death. Of the number so received, only four thousand four hundred lived to be apprenticed. Parliament, shocked at the failure of their grant, annulled it in 1761.

The income of the institution being thus cut off—for the old subscribers had of course fallen away when imperial aid was invoked—the governors were forced to obtain an immediate income. This they did by demanding an admission fee of £100 with every child taken in. This was indeed a premium upon the unbridled licence of the passions. The whole of the children so received were the offspring of rich fathers at least, and in many cases of fathers and mothers moving in fashionable life. For forty-one years this plan for easing the "quality" of their responsibilities stood its ground, and for how many more it may have gone on we cannot say, if it had not been abruptly snapped short by legal advice:—The mother of a child which had been received under this rule, although a consenting party to the separation, afterwards repented, and having discovered the residence of the nurse with whom it was placed in the country, practised upon her an artifice by which she obtained possession of the child, and refused to relinquish her right. The governors, feeling themselves under an obligation to reclaim the child, by exercising the powers which they

conceived to be vested in them, took a high legal opinion, when they were advised that, owing to their departure in this respect from the spirit and letter of their charter, and the Act of Parliament confirming it, they had no chance of being protected in a court of law. This was decisive, and thenceforth no child has been received into the hospital with any sum of money whatever.

The present plan of admission is very guarded, and assimilates more than any one that has gone before it with the founder's ideas. It is imperative that the following conditions be complied with before a child can be admitted:—

"1. That the child must be illegitimate, except the father be a soldier or sailor, killed in the service of his country."

We may say, by way of parenthesis, that the governors of the hospital have behaved very handsomely with respect to the latter condition of the paragraph. In the war in Germany in 1761, and during the Continental War in 1794, and on the occasion of the Battle of Waterloo, they freely opened their gates to the children of those who fell.

"2. That the child be born, and its age under twelve months.

"3. That the petitioner shall not have made an application to any parish respecting its maintenance, or have been delivered in any parish workhouse.

"4. That the petitioner shall have borne a good character previous to her misfortune or delivery.

"5. That the father shall have deserted his offspring and be not forthcoming, that is, not to be found, or compellable to maintain his child."

There is also a secret inquiry afterwards set on foot to verify the mother's statement, who is obliged to tell her story to the board, and if this double test is passed the child is admitted. We may say, however, that no children of soldiers or sailors killed in battle are now admitted to the institution, which is exclusively confined to those of illegitimate birth.

One of the curiosities of the Foundling is the glass case, in which are displayed a selection of the "tokens" left with children in the early days of the institution. That they remain here is a proof that the parents never reclaimed them. They present a singular spectacle—odd trifles of every kind, from a coin of James the Second and William and Mary, to a lottery ticket. An old silk purse is flanked by a stone cross set in silver. Then we see a playing-card—the ace of hearts—inscribed with some tender verses. There are several padlocks, emblems, we suppose, of silence and security. Many mothers sent pieces of brass, heart-shaped, with some verses engraved upon them. There is also a book, in which distinguishing marks, in the shape of ribbons and needlework, are preserved. Some of these are very interesting—worked caps, bunches of ribbons, a book-marker with the words "Cruel separation" marked upon it, and some finely-wrought lace. Sometimes there were verses pinned on to the clothes of some of the children, intended to be of a very pathetic character. Here is one of these inscriptions:

"Go, gentle babe, thy future life be spent
In virtuous poverty and calm content;

Life's sunshine bless thee, and no anxious care
Sit on thy brow, and draw the falling tear;
Thy country's grateful servant may'st thou prove,
And all thy life be happiness and love."

This is evidently mother's pathos. The clerk who took a record of the clothes of another child is considerably more prosaic. Thus, he says of one child, it had—

"A paper on the breast,
Clout over the head."

Of course there are no tokens exposed of the £100 infants that came in during the forty years from 1760 to 1801. The secretary keeps an honourable silence respecting any distinguishing mark they may have had about them. It is just possible that some of those foundlings may be still alive, but even then, we do not see how a token could in any way lead to their identification—not to visitors at least. Very few who have been received into those walls have ever in after life made any inquiries respecting their origin; but some years since an aged banker in the North of England, received into the hospital during the days of the Parliamentary grant, was desirous of becoming acquainted with his origin, when all the information afforded by the books of the establishment was that he was put into the basket at the gate naked. All his fine clothes were probably stripped off him by the carrier.

The children received into the hospital are all christened after reception. Of old, their baptism used

to be attended by ladies of quality, who used to honour the little ones with their own names. The early registers contain nearly every name in the peerage; when these were exhausted, the great names of the Church were put under contribution; then, again, all our old poets, from Chaucer to Milton, lived once again in name; and finally the list of painters, native and foreign, was run through. Now a list of names is picked out of the Directory, and fitted to the children, hap-hazard, as they arrive. There are at present four hundred and fifty children in the hospital, boys and girls. We all know the quaint-looking girls in their old-world caps and gowns; the boys are anything but becomingly dressed. They are all taught to sing and play well, and the choral service at the Foundling Chapel is one of the great metropolitan attractions. The infants are placed out to wet-nurse in the counties adjoining London. The Foundling is supported from the revenues derived from the ground-rents arising from some of the land they purchased so cheaply in the middle of last century, and the interest of certain stock. The income is barely sufficient to meet the outgoings at the present moment, but when the whole ground-rents fall in, as they will in about twenty-five years' time, it will possess a princely revenue. Finally, we may say that the boys, at the age of fourteen, are apprenticed as mechanics, and the girls, at the age of fifteen, are sent to domestic service. We must not forget to mention that the walls of the Court rooms are embellished with the works of Hogarth, Gainsborough,

Highmore, Hayman, and Wilson, affording a fine gallery of English art as it flourished in the last century. This gallery is open on Sunday. The visitors to London should not fail to see the grand portrait of Captain Coram by Hogarth, and his celebrated "March to Finchley."

DUST AND HOUSE REFUSE:

SHOWING WHAT BECOMES OF THEM.

If the reader is in the habit of crossing the canal bridge near the Bishop's Road Station at Paddington, he will, perhaps, remember perceiving, some little way up the banks of the canal, a busy scene going on which he cannot exactly make out. A crowd of women toiling and moiling amid heaps of rubbish, two or three barges laden with vegetable refuse, he can distinguish plainly enough; but it is not until he sees a string of dust-carts slowly wending their way towards the distant wharf, that the thought flashes upon his mind that the busy human ants he has been watching are scavengers, sorting and arranging the refuse of this great metropolis. There is nothing particularly attractive in a scavenger's yard: neither the sights nor the smells are pleasant: nevertheless the scene that here meets his eye, repulsive as it is, could not exist in any other than a high state of civilization. When we think of it, the dust-bin is the tomb of the household; it is the grave into which all our domestic surroundings inevitably sink. Of old, in the ruder states of society, this dust and refuse found

its final rest in mother earth, but with us its removal by the scavenger is only the first stage of its elevation to a higher life, if we may so speak. In detail, as it exists in every household, it is a nuisance to be got rid of; in the aggregate, it becomes a very valuable commodity to be re-imported into our arts and manufactures.

As the great lumbering carts arrive in a great dust contractor's yard, their contents are emptied into isolated heaps. No sooner does this take place, than they are each in detail attacked by grimy men, who remove all the larger articles, such as vegetable matter, old coal-scuttles, old crinolines—of which there is a rather large supply just now—old hats, and old garments. This is a kind of rough sifting, which prepares the heap for the attacks of the women, who instantly settle upon every heap like a flock of crows that may happen to spy any carrion in a field. Each woman as she settles upon the heap comes sieve in hand, and spreads around her a number of baskets; the man now fills the sieve, and the process of separating the dust-heap into its elements begins. The first few shakes of the sieve throws down all the fine ashes and the coal-dust. This detritus, which is absolutely "dirt out of place," to use the forcible saying of a great statesman with reference to sewage, becomes a very valuable commodity when collected and put to its right use. It is used by brickmakers to mix with the clay, and does its part in the ultimate baking of the brick. In the neighbourhood of most of our great railways near the metropolis, our readers may have noticed vast heaps of

fine black dust burning with a slow combustion and with much smoke. These heaps consist of bricks which are being baked. They are placed in rows a little apart, and their interstices are filled up with the fine "breeze," as the coal ashes are termed, a light is set below, and gradually the whole mass fires to a dull red heat, the breeze intimately mixed with the clay helping to bake the inside of the brick in the most perfect manner without vitrifying it. The breeze is the most valuable portion of the dust, and it rises or falls in value according to the amount of building going on, and according to the rate of its production; in the summer but little comparatively is made. Coal-dust, it must be remembered, is entirely a distinct refuse from road-dust, which also possesses a certain value, as we shall show by-and-by. When all the finer refuse has passed through the sieve; the larger and coarser articles, remain upon the top. There glisten some pieces of broken glass; this, of course, only requires to be remelted to be put once more into circulation in the world. Considering the brittle nature of this material, and the enormous quantities of it employed, it is certainly fortunate that it is almost indestructible. When we break a window we only alter the arrangement of its particles. Broken into a thousand pieces, it remains as good glass as ever; time will not touch it. The remnants of glass that are found among the Roman remains, that have been lying in the ground for two thousand years, are as fit for the glass-pot as though it had been made yesterday. Old bottles are put once

more into circulation; phials are very rarely even chipped, hence they are merely washed, and they pass once again into the drawers of the chemist or apothecary.

Bones form another very constant contribution to the sieve, and a very valuable item it is to the dust contractor. There is a grand tussle going on for its possession, both by the manufacturer and the agriculturist. The larger bones are first boiled, in order to extract from them all their fat and gelatine. The purposes the former article is put to are too numerous to be mentioned; a good deal of the finer kind goes to make pomatum and soap; the gelatine is, we do not doubt, used as the basis of soups; and we know that it is employed in the manufacture of jujube lozenges. Thus we suck our bones over again after they have made a no very savoury journey. The smaller bones, which cannot be used in the constructive arts, are equally valuable in agriculture. When ground down to a fine powder, and mixed with sulphuric acid, they become the great fertiliser, superphosphate of lime, restoring to the soil all the productive qualities that have been taken out of it by over-cropping. Wheat-growing is very exhausting to the soil—indeed, we could not go on growing wheat for many years without reducing it to sterility, were it not for the use of this superphosphate. Phosphorus, again, is another extractive from bones. That which has once had life cannot be utterly destroyed: indeed, there is no such thing as destruction in this globe—if there were, we should have come to a

stand-still long ago. There is change and transmutation, and thus all things in nature are perpetually circulating; the grass is transmuted into the substance of the ox, the ox is eaten and transmuted into the substance of the man, the man in turn mingles with the dust of the fields, and enters into the substance of other animals.

Old iron finds its way into a very spacious sieve. Like the glass, its substance is difficult to destroy—indeed, some old iron is rendered much more valuable by being knocked about. Thus, old iron in the form of horse-shoe nails, and, indeed, horse-shoes themselves, fetch a much higher price than the original metal from which they were made; the toughness it acquires by constant blows and concussions gives it a greatly enhanced value in the market. Old tinned articles, such as slop-pails and saucepans, are first heated to recover their tin and the solder with which they are made, both of which articles are more valuable than the old iron. Paper is carefully collected, and goes once again to the paper-mills. Like glass, the original fibre is very indestructible. For all we know, the note-paper on which we indite the tenderest love-letters to our mistress was made from an old account-book of a tallow-chandler, or from the musty records of the past centuries. Mr. Simmonds gives some still more curious examples of the use of house refuse:—"Turning over a ragman's basket (he says), what a singular history we have. The ball-dress of a lady drops into a rag-basket and reappears as a billet-doux; disappears again to reappear

once more in the drawing-room or the nursery as a work-box (papier-maché) or a doll."

Whilst, however, we are watching the sifters grubbing over the heaps—as we have said, like so many crows—they all rise together as we sometimes see these birds do, without any apparent cause, and make off to the nearest public-house. But there is a cause, we may be sure, for this sudden flight. If you ask the over-looker, he speedily enlightens you: "Oh, they've been and found some money in the dust-heap, and when they do, it is a rule among them to share it together in drink." By-and-by, their little jollification over, they return. If there is anything that can be used as food in the dust, the "hill-women" are entitled to it as a perquisite. In this manner they obtain many pieces of bread which the reader might not like to eat, but which they do not object to. All the pieces of wood are also considered to be theirs, and when they leave work they may be seen laden with fuel of this kind, which saves them more expensive firing. The broken china and crockery goes to make the foundations of roads and paths, and all the "soft core"—to wit, refuse vegetable matter—is returned directly to the fields in the shape of manure. Old clothes are not the least valuable items of the dust-yard. Anything in the shape of cotton, even to the covering of the crinoline steels, are put aside for the paper-mill. Cloth finds its way to the shoddy-mills of Lancashire, where it is purified and ground down, and re-made into coarse cloth. Some

persons very ignorantly stigmatise the shoddy manufacturers as a class of people employed in a work a little above swindling. "The shoddy aristocracy" is a term of reproach, intended to cast a slur upon an energetic class of tradesmen who have been guilty of no greater crime than that of arresting the descent of the woollen fabric into the manure heap, and of once more setting it afloat in the commercial world as a material for the construction of a garment. If there were no such things as shoddy-mills, the clothing of the poor would be vastly enhanced in price; indeed, we do not see how they could procure warm winter clothing at all, considering the high price of wool at the present time. The old woollen garments that are thus turned into shoddy are equal to a contribution of twenty-five thousand tons of wool. Yet these cast-off old clothes, not many years ago, were considered of no more value than to be thrown upon the manure-heap, there slowly to suffer disintegration until fit to be placed upon the land. Indeed, there is a class of rags which is now taken directly to the soil. Old house-cloths and dish-clouts, soaked with grease and animal refuse, make capital manure. In the dust-contractors' yards we may see them spread out upon the ground to dry, preparatory to their being forwarded to the hop-grounds, where they are much used for the cultivation of that plant. Old boots and shoes, if not too much dilapidated, find their way to St. Giles's, or the back slums of town, where a class of tradesmen live who patch them up,

and by the aid of heel-ball make them once more presentable.

We had almost forgotten to say that no inconsiderable amount of coal is rescued from the dust-heap. This, of course, does not go to the brick-yard—it is purchased by the poor. In well-to-do neighbourhoods, and especially in the fashionable quarters of the town, the ashes are rarely sifted, hence pieces of coal half burnt, or small lumps, are thrown away every morning. This extravagance makes the "dust" of the better portions of the town far more valuable than that collected from the poverty-stricken districts. Indeed, the dust in the West End is richer in every valuable refuse: there are more bones, more breeze, more refuse clothing, than ever find a chance of getting into the middens of the East End; we may even safely assert that the sewage itself is far richer when drawn from the former sources than from the latter. Of old, the scavengers were employed as night-soil men as well as dustmen, but now this valuable refuse of organic life drains off into the country by vast sewers lately constructed. The value of this refuse is enormous, and in a few years would be sufficient to repay the different parishes for the cost of scavenging the town; but unfortunately, for a term of years at least, it has become the property of a private company, which will reap a golden harvest by the application of it to the land.

We have said that the dust from the roads is kept quite distinct from the dust of the ashpit. Road-dust

is always very rich in manure, which makes it valuable as a top-dressing for meadows. It is also largely used to mix with soft clay for the making of inferior bricks, and we have ascertained that it is also used for a more unsightly adulteration. The compo with which many of the cheaply run-up houses are smoothed over and made to appear ornamental, is very freely mixed with road-dust. The evil of this we speedily see in the green stains with which all such structures are disfigured, such green stains being nothing more than a vegetation which occurs in all damp spots, which finds its support in this surreptitious dust.

The grimy scavenger and the filthy-looking "hill-woman," however repulsive they may appear, perform, it will be seen, a most valuable part in the world. By their aid we return to the exhausted fields the riches the towns have drawn from them, and they arrest from speedy destruction a score of valuable products, and set them once more in circulation in the busy world. We think we have shown that you may look upon many a more unworthy worker than the grimy scavenger.

THE OMNIBUS SYSTEM IN LONDON, PAST AND PRESENT.

In all matters of locomotion the English are supposed to lead the way among the nations. This may be the case; but it is a singular fact that omnibuses were in use in Paris ten years before they were introduced into London. In 1819 M. Lafitte brought out the first of these now familiar machines in the former city with great success, and for many years they were running at a cheap rate, whilst our short stagers—regular coaches—were endeavouring to carry on the immense traffic of the metropolis at fares nearly double the price at which riders were carried by these convenient vehicles. This is a singular instance of our tardiness at catching a new idea in a field that we thought peculiarly our own; and probably we should have gone on for years with our heavy stage-coaches and scant accommodation, had not a Briton resident in Paris, and cognisant of the profitable working of the omnibus system there, determined to introduce it in the English capital. Mr. Shillibeer, who commenced this enterprise in 1829, of course met with the determined opposition of all the stage-coach interest.

His vehicles were called coffins, vans, and any name that implied contempt. Nevertheless, his venture from the first was a great success. The first line chosen was from the Yorkshire Stingo to the Bank, at a charge of one shilling, with half a fare from King's Cross. The original 'bus had three horses abreast, like those universally used in Manchester and the North generally, and also in some parts of the metropolis. But the original vehicles had no outside places. So far, this was a retrogression from the old stage-coach, inasmuch as Englishmen will seldom ride inside any vehicle when they can get outside. Nevertheless, this arrangement was followed for twenty years before a feeble attempt was made to introduce outside places. It was in 1849 that some daring genius in the coachmaking line ventured to place a narrow slip of board along the top of the omnibus; this board *Punch* wickedly nicknamed "the knife-board," and truly it was not a bit wider than a knife-board, and being without any back, it required a constant effort on the part of the rider to keep his spinal column duly balanced. Of course there was no attempt at facilitating the rider's ascent to this uncomfortable seat. He had to climb up by way of the window and the top of the door of the 'bus. It seemed as though the daring innovator who restored the outside seats to the open-air-loving British traveller, was afraid of going too fast even in the way of meeting a general want, lest the national spirit of Conservatism should be offended. The present comparatively com-

fortable seats on the outside, and the iron steps to mount, do not date later back than 1862, the period of the last Exhibition. In one particular we are reverting with advantage to the original large 'bus introduced by Shillibeer, with the addition of outside seats. The weight of these exceedingly roomy omnibuses requires the use of three horses abreast. The division of the inside into first and second class is another improvement copied from the present French diligence which we should like to see brought into general use. At present, these really luxurious 'buses only ply from the Portland Road Station of the Metropolitan Railway to Regent's Circus. Many ladies dressed for the promenade do not care to be placed side by side with some dusty labourer; this class would willingly pay a little more for better and more select compartments, with well-stuffed cushions, and more ample skirt space. The general complaint against the common omnibus is that it is too small, and but too often very dirty. In the face of the cheap and luxurious travelling by the underground rail this is a serious charge, which should be remedied; otherwise the call will be for the universal spread of this underground means of progression, and the omnibus will become a thing of the past.

The Shillibeer lead was followed by the old coach proprietors, as soon as they saw that it was an undoubted success, and the introducer was driven off the road by the competition he had to encounter. After a time the omnibus system began to develop itself throughout the length and breadth of the metropolitan

limits, and different districts were worked by small companies, or by individual proprietors. In 1857, however, a company was formed in Paris, which bought up nearly the whole of the 'buses then running, together with their "times." Let us explain what is the meaning of a "time." It is by universal agreement arranged that certain omnibuses have the right of working at certain times of the day. The whole working day is divided into so many "times," which the omnibuses have to keep. These times are on some roads very frequent—on the more frequented lines 'buses will pass the time-keeper every three minutes. There is no law to enforce this usurpation of the road, but the organization is so perfect that any omnibus attempting to cut into these settled times is sure to be followed and "nursed" so carefully that it is driven off the road. To nurse an omnibus well is a highly scientific art; the object is to wait upon him so narrowly in front and rear, and sometimes to the right and the left, that the imprisoned vehicle has no chance of picking up a passenger. All the while this trade combination is being carried out, the most fearful abuse is going on by the opposing parties, and very often the lives of passengers are endangered by the rapid driving, and the reckless manner in which the vehicles will cut across the paths of the omnibus waited upon. Since the Paris company has become a Metropolitan company there has been very little opposition, and consequently little nursing, the monopoly having become so powerful. Whether this usurpation of the

metropolitan thoroughfares by one company, whose object is to prevent competition, is legal, is a very doubtful matter: racing and nursing most certainly are not, but the magistrates seem utterly powerless to prevent it; at all events they never touch the managers of the company, who are the persons really responsible for this nuisance, although now and then they send a driver to prison, or make him pay a heavy fine. In either case this worthy is compensated for carrying out his orders in the face of the law; so the little game is now and then carried on with impunity. The only advantage the public derive from the fact of the whole omnibus conveyance of the metropolis being in the hands of one body, is the economy that is thereby secured in the working expenses. The General Omnibus Company carry more people by the ordinary horse conveyance than any other company in the world. Its internal arrangements are, therefore, worthy of investigation. Its carriages could, within an hour, convey the whole army of many a respectable German power from one side of the metropolis to the other. The number of omnibuses running depends upon the season. In the summer there are more running than in the winter. I may remark, however, at starting, that I was scarcely correct in saying that nearly the whole of the metropolitan omnibuses were in the hands of this company. This is true only of those running on the Middlesex side; on the Surrey side there are still many private omnibuses running, but their number is but small. In the winter the company put on nearly

eight hundred conveyances, and in the summer nearly twelve hundred. But I am told that it is only the summer months that yield a profit. When I see the crowd on the outside in hot weather I can readily understand this; ten inside and twelve outside is a tolerable load, yet we see such loads leaving the Regent Circus every half minute for several hours in the day during the season. On the average, each omnibus earns two pounds sixteen shillings a day; but in the long days, when there are so many country people coming from and going to the suburbs, the average often exceeds four pounds a day. There are certain omnibuses which run specially to suit mercantile men and City clerks; these are called the morning express 'buses, doing the whole journey from west to east, a distance of more than seven miles, in forty minutes. Towards the middle of the day all the times are both slower and at longer distances between each other; sometimes in the afternoons the omnibuses return completely empty, so that many journeys are an absolute loss to the company.

The number of horses required to work these omnibuses is prodigious. As the Londoner may have observed, a pair of horses only goes one journey; and as the omnibus generally does four journeys, each conveyance, with its rest-horses, requires ten animals. The three-horse 'buses require thirteen each. To accommodate upwards of seven thousand horses, the company possess at least four hundred stables scattered all over the metropolis, in situations convenient for changing.

The horses are not overtasked, many of them not going more than twelve miles daily, and none of them more than fifteen; but while they are at it they are sharply worked. The omnibus itself is one ton in weight, and estimating a full load of twenty-four persons at only another ton, we have two tons to be dragged. If this were all, it would not be so bad; but there is the constant stopping, which frets the horses more than regular work. The command of the 'bus is wholly in the hands of the conductor, who regulates its speed in order that he may cut into as much of the time of those who go before and follow after him as he can with safety. This is another source of fret to the horses, whose mouths are perpetually pulled about to suit the ideas of the cad, whose eyes are ever on the look-out to see if the 'bus that follows is within sight. When this is the case the coachman is telegraphed to put on the steam, and sometimes, in hot weather especially, he is irritated by this command, and then there is a war of choice words between cad and Jehu, of which the passengers have the advantage. The pay of a driver is a couple of guineas a week. This may seem a large sum, but the hours are long, rarely less than fifteen a day, and the exposure to all weathers makes him rheumatic. You rarely meet a driver who is free from a touch of the rheumatics, and I find that they are in consequence not long-lived. The conductor gets less—eight-and-twenty to thirty shillings, without deductions; but then, as he has the handling of the money, some of it, it is whispered, sticks to his fingers. Mr.

Shillibeer, the first adventurer with these omnibuses, was beaten out of the field by the perpetual peculations of his conductors; and I am told that the annual losses of the company amount to twenty-five thousand pounds. A dishonest conductor, however, knows that he must not dip his hand too far into the receipts of the company, inasmuch as they can measure his takings by those of other conductors on the same line of road. If it is found that as a rule he falls short of the average, the check is put upon him, in the shape of a female detective, who rides the long journey, and takes a minute account of what every passenger has paid: this sum is compared with the receipts of the conductor on his way-bill, which he makes out every journey. If it is found that his statement falls short of the real receipts, he is simply told at night that he may go, and as he is only a daily servant, go he must with a damaged character. This knowledge on his part keeps him within bounds; but the annual loss I have mentioned is a pretty convincing proof that robbery is carried on to a large extent without any possibility of its being avoided by the proprietors.

If we mistake not, a thorough revolution is at hand as regards the long distance omnibuses, and those travelling in the suburbs. We allude to the system of trams. Train's failure a few years ago stopped the movement, but now we find the roads lined with sunken rails, which do not obstruct ordinary travelling. If to the roomy omnibuses now running upon them

so easily, horses could be dispensed with for a noiseless locomotive, the revolution would be complete.

All the food for the seven thousand and odd horses is specially prepared at the feeding depôts of the company at Bell Lane, and at Iron Gate Wharf, Paddington. The system on which the company feeds its horses is worthy of the attention of all who have much to do with these animals, and require to give them as much rest as possible. The horse's food is so prepared that it shall take the animal the shortest possible time to consume it, in order that he may lie down and have his rest. It is therefore cut up fine, and consists of a mixture of various nutritious materials—Indian-corn, oats, barley, chaff, &c. This mixture is weighed out to each horse—a very proper precaution where so many have to be fed; each animal is allowed nineteen pounds of corn and ten pounds of chaff per day, thoroughly mixed. I am told that upon the price of corn the nature of dividends declared to the shareholders is governed: if corn is dear, a poor dividend may be expected; if it is cheap, a good one. When we consider that the cost half-yearly of this food is one hundred thousand pounds, the price of this item must make a material difference to the credit side of the ledger.

The company build their own omnibuses, chiefly at Holloway, where they have very extensive premises, and stabling for nearly eight hundred horses. Of late years they have all been constructed upon one pattern, in which there is, I think, great room for improve-

ment. The omnibus of 1867 is a far less attractive, and, we may add, less comfortable vehicle than Shillibeer's premier omnibuses of 1829. The present idea is to build as cheaply and as strongly as possible. The cost of the ordinary omnibus is one hundred and twenty pounds, the three-horse 'buses cost one hundred and eighty pounds, and I should say the Metropolitan Railway omnibuses cannot be made for less than two hundred and fifty pounds. The great desideratum is lightness and strength: steel is the only material capable of producing these qualities; it may be a more expensive material than wood, but it is a much more durable one. The present 'buses are calculated to last on the average ten years, but a well-built steel omnibus would last double that time, and for the same weight would accommodate five or six more people comfortably.

What has become of the correspondence system? In Paris, by means of a ticket, you can pass from one end of the city to the other by all manner of cross routes. We tried a similar arrangement some years ago, but as I have heard nothing of it lately, I suppose it must have died a natural death.

BUYING HORSES: THE TRICKS OF THE DEALERS.

Every Englishman believes that he is a judge of a horse: his vanity may not lead him so far as to suppose that his judgment may not be controverted, but he believes that, as a Briton, the love and knowledge of horse-flesh is inborn with him. Every young man will look knowingly at a steed as he passes along the street, and will even venture small hints, chiefly of a disparaging nature, with respect to his friend's nag. But ask the same man his opinion of a cow, and he will laugh at the idea of his being expected to have any opinion at all upon such a matter. Many a man looks far more critical than he really is in such matters, and, as a consequence, takes his friends in—there is nothing like a little cunning reticence in such affairs. Assume a virtue if you have it not, seems to be the weakness of us all where horse-flesh is concerned. If a man will only seem to be knowing with many, he will succeed. Sir Emerson Tennent, in his work on Ceylon, gives a capital anecdote touching elephants, which proves that in the far East a very ignorant man may make capital

out of the same sort of intelligent silence. The story is to the following effect:—An elephant dealer arrived in the market with a string of six elephants, five of which he managed to sell, but the sixth hung for some time on his hands. At length he observed a native of intelligent appearance eyeing the animal from head to tail, in the most attentive manner. "I can see," said the dealer, addressing him, "that you are a good judge of elephants. Now listen; if you will make no remarks about his bad points to any one wishing to purchase him, I will give you fifty dollars." Presently a purchaser came by and gave the dealer five hundred dollars for the animal, and walked away with him. "Now," said the dealer, "there are your fifty dollars; but will you oblige me by letting me know how you discovered the animal was unsound?" "Indeed," said the man, pocketing the bribe, "I know nothing about elephants. I never saw one before in my life, and I was looking at him all round in order to discover which was his head and which his tail." Many a man in our own country has made capital out of his ignorance in the same manner.

There is no more taking bait to those unversed in the ways of the rogues who deal in horses than an advertisement in a leading paper. A cunningly worded advertisement, to the effect that "a horse, late the property of a gentleman in a hunting county, well up to twelve stone, may be viewed at —— stables, and a trial allowed," is sure to take in somebody, otherwise we should not see it appear with such unerring regu-

larity. The Park hack is perhaps the best card, inasmuch as it addresses a class of riders far more likely to be taken in by outward appearances. A man who wishes to cut a swell in the Ride is pretty sure to be taken in by outward appearances. Young ladies, again, of gushing and impulsive natures, seem formed for the purposes of the horse-coper. There are gangs of these men who make their living by buying up showy horses that have some great defect which makes them worthless, but which their art enables them to disguise just as long as is sufficient to take in their dupes. There are horses, for instance, which go dead lame in one shoulder, which those knowing fellows disguise by creating a similar lameness in the corresponding leg. This will be done by taking off the shoe and inserting a bean between it and the foot. It seems difficult to imagine how a double lameness should appear to make the animal go right, but we are assured such is the case. There are beasts, again, of splendid appearance, which go with splendid action so long as they are being trotted up and down the yard, but the instant they are mounted the impossibility of riding them is made evident. Such a beast is known as a "Bobby." He suffers from some disease of the vertebral column which renders it impossible for him to carry any weight whatsoever. There are other horses, again, that are simply old and worn out with age, that form a capital stock in trade to the clever scoundrels that trade upon their knowledge of the beast. An old woman, by the aid of the milliner and a professional beautifier, can be made

"beautiful for ever;" why, then, should horses be discarded, merely because age tells upon them? There is so much in common between the horse and the human being, that we are by no means surprised the former is now and then made up quite as much as the latter. Look at those flowing tails which sweep the ground in my lady's carriage: who can doubt, as they switch to the right and left to clear away the flies on their flanks, that they are genuine appendages of the noble animals? Yet go into the stable at night, and then you will perceive the tails hanging upon the wall, and the noble beasts, for coolness' sake, munching their oats, with the stump of their tails smoothly shaved, almost as smoothly as her ladyship's head, as we perceive when her maid removes the elegantly-arranged wig, and hangs up the chignon of such portentous size for the night. We have heard of such things as painting horses, obliterating white spots with dye—a clever trick, which answers only for a very short time, inasmuch as the new growth appears as grey as ever, and the steed presents the singular appearance of being white at the roots of the hair and black at the points, very much like the quills of a porcupine. There are other means of getting up old horses, which possibly the reader has never heard of. Old horses are as liable to show the inevitable signs of age as human beings; his teeth will protrude at an unpleasant angle, he will have deep pits over his eyes, owing to the absorption of the subcutaneous fat, and grey hairs will make their appearance all over his coat. To get rid of these signs of age, the professional

beautifier of the stable possesses appropriate devices. The practice of filing down the teeth is well known, but to give a horse a smooth surfaced tooth would deceive but few, as the cavities and the dark markings in the teeth of all horses are too well known; but man is equal to the occasion. The "bishoping" process restores, by the aid of a hot iron, in appearance at least, the dark marks of the cavities which appear on the biting edges of all young horses. The process of filling up the depressions over an old horse's eyes is another matter that requires the art of an adept. This is termed "puffing the glims." The skin over the cavity is punctured, and the coper then fills it with air from his mouth, the aperture closes, and the brow becomes as smooth as in any youthful horse—for a time. The white hairs of approaching age are painted out, and the animal puts on an appearance quite as good as many a dowager of May Fair does at an evening assembly—provided she be not scrutinised too narrowly. Discovery of these tricks on the part of the horse-coper is sure to come very speedily, but the coper, of course, is never to be found when the purchaser returns with the written warranty. The Vet who examines him recommends his sale to the first bidder, and the animal is sure to fall again into the hands of some confederate, by whom he is made up again, and goes through his part with the same success as before. Unless a man is accustomed to horses, it is the greatest folly in the world to depend upon his own knowledge in purchasing them. As a rule, he may depend upon

it he is playing with bowls that have been loaded, and he is sure to come off second best. A fair fee to a Vet for his opinion is the best economy in the end.

We suppose at all times there has been more or less of fashion in the style of horses used by the upper classes. We have only to go through an old picture gallery to find out that the horse of one age no more looks like the horse of another, than the beau of Queen Anne's days is like the swell of the present day. The breed and the manner in which they are trained as much alters the horse's appearance as the clothes the gentleman wears at one end of the century differ from the clothes his descendants wear at the other end of it.

Let us look at the horse of the period of the early Georges, with his heavy head, thick quarters, and long-flowing mane and tail, and compare him with the nag at the end of the last century, with his lank look, cropped tail, and closely-trimmed heels. They do not look the same animal. Neither are they. Within the two periods the Arabian blood has fined and polished much of the heavy Flemish blood out of him. Blood and costume—if we may be allowed the word—have told upon him. Let us look at any of the horses of the latter end of the last century and compare them with the Park hacks of the present day. How wide the difference. The docked tail and the short mane has given place once more to the exuberance of nature. Never, perhaps, was the riding-horse in greater perfection than at the present moment. The judicious mix-

ture of blood, which gives him such beautiful form, is all our own; but, as we shall show presently, the education is foreign. There is only one style of horse of the past which is still preserved among us in all his integrity—we allude to the cream-coloured state horses, the breed of which is still rigorously preserved in the stables of Hampton Court Palace. This breed comes from Hanover, and is therefore especially appropriate in the stables of the present Royal Family. If Charles Edward had succeeded at Culloden, we should never have witnessed these dignified but rather heavy beasts figuring in our state cavalcades. These horses are much larger than they look, very few of them being less than sixteen hands high. In them we see the type of the horse we used at the beginning of the eighteenth century, and, we may add, of the men too, with their heavy sensual faces, all the more obese and flabby-looking for the absence of the beard and hair nature had given them. The Park horses of the Ride are of pure English blood, but of foreign education. These fine animals pass into the hands of Prussian cavalry officers, by whom they are carefully trained in the ménage. The Government allows each officer to keep three horses, and he employs his time in training them to the perfection of carriage we witness in Rotten Row, where so many of them are to be seen. It may not be a very dignified occupation for military men, but we do not know that our own officers spend their time in much higher pursuits, although possibly they may not be quite so economical. The value of the English stock,

crossed as it was in the beginning of the eighteenth century with Arabian blood, has long been acknowledged by other nations, and their descendants, exported to other countries, have of late come home to try conclusions with us. America and France have, indeed, carried off some of our highest prizes at our great races, but we need not complain of this; many of her men have come back to the old country too, and shown that the old stock has not deteriorated by long residence in a foreign clime.

The improvement in our racing stock commenced, no doubt, with the infusion of Arab blood it received early in the eighteenth century—not certainly in swiftness, as some people imagine, but in the power of endurance. The early English horse for a short burst was even superior to the best Arab in speed, but the latter animal got the best of it in a long race. The combination of the two has given us the splendid racer we now possess, which breed has given refinement to the ordinary riding hack of common life. It does not appear that the English racer has in any way deteriorated from his condition of old; some of the modern races have been run in quite as quick time as any of the old ones. We are alway too apt to depreciate the value of present things in comparison with those of the past, and when we hear of Flying Childers having run a mile in the minute, the old tune of the depreciation in our stock is immediately set up. But it is not true that Flying Childers ran a mile in the minute; his running, according to the Newmarket record, was at the rate of one

mile in a minute and forty-six seconds—a speed not higher than first-class running of the present time. It is quite certain that our best horses have not deteriorated in speed; but whether they have not lost, through want of training, some of their lasting powers, is a very different thing.

The fame of the English race-course has stimulated other nations to breed race-horses, and from France and the United States the descendants of our own best horses have come back to challenge, and in some cases to beat, our best blood. We need not be surprised that on a few occasions they have carried off prizes; on the contrary, the proper light in which to view such triumphs on their part is, to consider that our example is so potent even in the matter of public games. It will be a long time, we fancy, before either France or America will be able to set us a public example of this nature that we shall care to follow. If there should ever be a veritable struggle for the blue ribbon of the Turf, we shall have no fear of the result.

The carriage-horse of the present day owes nothing to the foreigner, either by way of breed or training. The majority of the splendid animals we see in the drive are bred in Yorkshire of pure English blood. The colour most sought after is a dark chestnut-brown, mottled with still darker brown, which deepens into black in the legs and in certain portions of the head. Many of these animals, sixteen hands high, are the perfection of form and strength—far more elegant than the old Hanoverian type, which we keep for Royalty.

Many of these splendid horses will fetch in pairs four hundred guineas, and the dealers often make it a favour to part with them even at that price.

For children's riding, grey cobs—the fashion for which has been set by Her Majesty, who possesses many for the Royal children—have been very much used of late. Her Majesty has never cared much for her stables, and this must be attributed to the total disregard of the late Prince Consort for horses in any shape. In this respect his tastes were not those of Englishmen, and the consequence was that, in his lifetime, the Royal stables very much deteriorated ; indeed, they have never recovered their old fame, and perhaps there are fewer animals of any value to be found in them than there has been for a half century at least, certainly since the period when George IV. was in the height of his career. The Prince of Wales has revived the old English taste for fine horses, and there are very many fine animals in his stables at the present time. Possibly the Princess of Wales set the fashion for small Highland ponies, so many of which we see in the parks, driven by lady whips. Ponies have long been the rage among the fashionables in London. Not many years ago the little Exmoor pony, a small shaggy animal not much bigger than a Newfoundland dog, was worth as much as a hunter in the London market. These high-bred little fellows—as hard as steel, and as full of courage as a lion—are allowed to run wild on the Exmoor, miles of which are surrounded by a stone wall, and is the property of a private individual. Having to

make their way over rough ground, and to jump steep dykes, they become very sure footed and splendid leapers. It is possible they have some of the original breed of the aboriginal horse of the early Britons; if so, it is a singular fact that they have come once more to the front in the service of the wealthy.

WHAT SHALL WE DO WITH OUR YOUNG LADIES?

We fear this is a question which puzzles many an anxious father and mother. "Marry us," the young ladies would say, of course; but unfortunately, this is not a romantic age, and the young ladies we wish to refer to in this paper are capable of bringing nothing to their husbands but pretty faces. What can a young man on the threshold of life do with a partner who is only clever at crochet, or can only play a waltz? Struggling men want helpmates, and unfortunately the education our women receive by no means trains them to be useful, however ornamental they may fancy they are. This being the state of the case, it has become a great social question, what shall we do with our girls? How many a professional man's heart aches when he thinks of the probable hard fate of his little girls growing up. What is their look-out when he passes from the scene? For young women of the middle classes there is but one path left open, and that is far from being a flowery one—they must be content with the position of a governess.

It seems exceedingly strange that the only occupa-

tion sanctioned by usage, is the one above all others that requires not only special qualifications but special training. Let us ask ourselves, looking round among the females of our acquaintance, how many young ladies there are among them who possess either such qualification or training? The fact is, no young girl is doleful enough to believe that it will ever fall to her lot to have to support herself, neither do her parents anticipate such a fate for her. There is always hope in the future, and the belief that something will turn up, makes the majority put off any preparation for the days of adversity. Such days, for a large per-centage of what we may term the lower half of the middle class, are sure to come at last, and when they do come, what class is so helpless to meet them in the whole community as our young girls?

Of late years this truth has been clearly seen by many sensible women; but, unfortunately, they have begun the crusade on the behalf of their suffering sisters in a spirit which creates antagonism on the part of the men, and anything but a hearty acquiescence on the part of the women. Yet the crusade is a lawful one, and worthy of more attentive appreciation than it has received. Why should not women have their fair share of the more delicate employments and occupations of life? Certainly their sex cannot be urged against them. How many occupations do we find in which men are engaged that are purely sedentary, and require no muscular power beyond a woman's strength? Such occupations women may fairly claim. And first

among these we may mention the art of design? As a rule, women in England are lamentably deficient in any training in this direction, much more so than their foreign sisters; yet Government has put the means within the hands of any intelligent woman of educating herself to be a bread-winner in the various directions to which art design applies. The Government schools for this purpose are admirably conducted, at a cost within the means of the vast majority. But a difficulty meets the trained female hand which certainly does not redound much to the credit of the opposite sex. A well-known watchmaker in the City gave us one example of trade dictation in this matter which is worthy of the attention of the Legislature, if the women in future are to have any fair play in their efforts to help themselves. Some young ladies, appreciating the advantages of a school of design, entered for a course of six months; at the end of that time their special aptitude for the work enabled them to employ themselves in engraving the backs of watches. Ladies' watches, it may have been noticed, are figured with some fancy design, a work light and agreeable, and, withal, remunerative—for we are informed that these ladies were earning three pounds a week at their occupation—when the men in the same employment struck against the "foreigners," as they politely termed them, and the employer was forced reluctantly to dismiss them. This act was as cowardly as it was uncalled for. Surely there is not such an overwhelming amount of male ability unemployed in England that

there could be any pretence for imagining that the new-comers overcrowded the market. If there is one want in the manufactures of this country it is the want of good art designs. We are admirable fabricators, which may be conceded to be the special province of the men; but we fail when the ornamental is concerned. Now, the female hand is specially adapted for such ornamentation as we have mentioned in this particular instance; but the workmen step in and say, You shall not exercise your special gift, we will have no "foreigners" amongst us. Luckily, this monstrous injustice did not pursue these intelligent young women further, as they found equally remunerative employment as glass engravers. In all matters where pliability of hand is concerned, as a rule, the woman is a better manipulator than the man: we say as a rule, because still to the larger brain of the man the highest excellence, even in this direction, is given. It is questionable whether there ever could have been a female Sharp or Woollet, but the great majority of engravings we meet with could have been done by the female engraver, as well as the male. When we think of the immense demand for steel and wood engravings in this country, and the growing taste for illustration in our literature, the field of engraving alone promises to open up a very large amount of occupation to young ladies if they would only turn their attention to it. Watch-making would seem to be a trade especially adapted for their capabilities: we know practically that it is so, for in Switzerland all the delicate parts of a watch

movement are made by women. There are no men among those hardy people unjust and ungallant enough to stigmatise their sister-workers as "foreigners." Indeed, if there were, the probability is that they would suffer for it, as the women workers are in the majority there.

In no country in the world, perhaps, is remunerative labour carried on so pleasantly as in this manufacture. It is done at home, and that home is the beautiful country along the Jura range in the immediate vicinity of the Lake of Geneva. The work is carried on in those smiling cottages so picturesquely dotted about the enchanting scenery. There are not less than twenty-five thousand women thus engaged in the neighbourhood of Neufchâtel alone. The system is admirable; there is great division of labour; all the parts of the watch are interchangeable, and the finished article is so cheap that it is smuggled over here in large numbers, at a price within the means of the working classes. Were it not for trade regulations, female labour could be employed at home in the same manner, and occupation fitted for a woman provided for thousands of females anxious for employment, yet seeking it in vain. We are told that the average wages of these Swiss artisans is fifteen shillings a week; what a blessing this sum would be to many a poor creature now forced to starve on six shillings a week at slop-work. We contend that to employ men at such work is the grossest waste of physical power, and therefore a violation of the true laws of labour.

It seems that a prejudice has been created against female labour by the eccentricities of some of the more prominent leaders of this movement. Nothing surely is to be gained by a mere aping of the dress of men. Doctor Mary Walker, for instance, could do her practice quite as well in the ordinary female dress as in the one she now wears.

There is no reason that we know of why women should not practise the healing art, but we think great judgment should be exercised in the selection of the branch of practice they should take up. A woman could not well become a general practitioner, the duties of which would often lead her into positions out of her sphere; but there is no reason why there should not be female aurists and dentists, just as there are female corn-cutters. The diseases incidental to women would also appear to afford a field for female art, but unfortunately the female patients themselves object to this arrangement. Women will tell you that they have no confidence in female doctors—in short, they do not care to be attended by them. There is doubtless some prejudice in this, because we find that in foreign countries, women in the most desperate diseases of their lives submit to the skill of women. We may mention the institution in France of the "Sage femme," whose striking sign-board pictures many of us have been amused with in Paris. We are far from approving this feeling of prejudice on the part of women. We only state it as a fact, which at present, at least, constitutes a practical difficulty in some businesses and

professions. To be short, the women like to be served by men, and men by women. It is a very common thing to hear a lady say that she prefers, when she visits the silk-mercer's shop, to be served by a young man rather than a young woman; and we are equally sure that men infinitely prefer a woman's ministration to the service of males. The truth is, the sexes are more deferential to each other than they are to themselves; they take more trouble to please, and therefore are more pleasing. This idea, if carried out in all its integrity, would, it is true, interfere with women's work in some instances—notably, in the occupation of shop assistants. If all the young girls were replaced by shopmen, a revolution would be worked in the field of labour, perhaps not advantageously, for there is no human creature who seems so much out of place as a strong young man handling silks and satins. Year by year, however, we find young ladies displacing the men where personal service is concerned. In every public-house, however low, the rough barman gives way to the young woman neatly dressed. A refreshment bar may not be a good school for females, but we confess we never saw the slightest impropriety in their behaviour there; and the presence of a female face at all times and seasons gives to such places an element of refinement they wholly lack otherwise.

We shall probably be accused of making an outrageous proposition, but why, we ask, should not young ladies be eligible for clerkships in the public service? In the Post Office alone these situations are counted

by the thousand. Surely there is nothing in the sorting of letters that women could not do quite as well as men. In the Money Order Office and Post Office Savings' Bank, again, the legion of clerks are employed upon calculations which even they must confess are not above the capacity of females. Women are particularly methodical and careful in matters of accounts, and we believe would do the work quite as well as it is done at present, and probably at a cheaper rate than by the young gentlemen now engaged. And why should they not be much more extensively employed than at present as compositors? This is so sedentary an occupation, and requires the exercise of such a slight amount of strength, excepting where the "formes" have to be lifted, which could be done by a porter especially employed for the purpose, that we wonder Miss Faithfull has not been more successful in her endeavour to open this field of work to women. The wages of females are lower than those of men; but there is a law of social science well known to economists, which makes it probable that the general rate of wages would not in the long run be lowered by the increased employment of women.

Those who have been abroad must have noticed that women are much more employed there than with us. Check-takers at the theatre, at the railway and omnibus stations, and in shops generally, are of this gender, and they seem to get on quite as well as we do. They even invade the men's province by acting as railway porters, &c.; and we actually saw, on one occasion, a gang of women employed on a railway carrying baskets

of earth to make an embankment. We do not say this approvingly, as such labour is a waste of function on the female side, which, by-the-bye, is still to be witnessed in this country. It is not many years ago that women were prohibited by Act of Parliament from harnessing themselves like beasts of burden to corves of coals, and hauling on all fours heavy loads through the narrow workings in the coal mines; and even now the females employed in rural tasks are sometimes put to work fit only for strong men.

These examples are given to show that the popular prejudice against the employment of women is by no means due to any chivalrous feeling on the part of Englishmen. We cannot make the excuse the French can, that during the wars of Napoleon the conscription took all the males, and left the hard work to be done by the females, a necessity which has since grown into a habit. There is a principle at work, however, which is draining off our young men, and of course causing a preponderance of the female element among us, which makes the chance of marriage more difficult every year —we mean colonisation. The young and energetic blood of the country makes for fresh fields and pastures new. Hence there is a necessity for the women to learn to earn their own bread. In literature the women have certainly held their own in the race for fame. Where in the last century they could count one authoress whose works became famous, we can now count them by the score. The women now invade our pulpits, not only discuss, but direct great social movements, and the world is becoming accustomed to see

them participating in undertakings they never would have dreamed of associating themselves with fifty years ago. The public voice allows them to do something more than spin. We are hopeful, therefore, that by degrees the barriers usage has erected against them will be thrown down. But whatever they attempt they must carry out with perseverance as a profession. If they enter the lists in competition with the men, the utmost they can expect is a fair field and no favour. We hear it continually said that women are not to be depended on; but this, so far as it is true, is owing to the fact that but too often what they attempt they do as something supplementary to their ordinary occupations, instead of accepting it as the business of their lives. And so it will be as long as we are in a transitional state between the old social idea which would not allow a woman to exercise her brain in matters beyond the limits of her work-box, and the newer thoughts which sometimes carry them into extravagant lengths beyond their sphere. Once let us see girls trained, as boys are, to certain professions and occupations, and we do not doubt that they will succeed. To bring about such a reform—we might almost say revolution—in the habits of one half of the human race, is no mean task, and is, we believe, quite beyond the powers of the few enthusiastic women who are labouring in the cause. The aid of the more intelligent men is required on the behalf of their weaker sisters, and if there is any true chivalry left among them they will certainly afford that aid.

THE TRAINING OF IMBECILE CHILDREN.

THERE are upwards of fifteen thousand imbeciles in Great Britain at the present moment, the greater portion of whom are not only incapable of helping to do their share of the work of the world, but who absolutely detract from it, inasmuch as many of them require to be watched, fed, and dressed by those who are not afflicted as they are. Fifteen thousand is a little army, the majority of whom are a burden upon the parish rates. Generally belonging to the poorer classes, who cannot afford to maintain them, they are transferred to the care of the various workhouses throughout the country, where they pass their lives without gaining an idea, and die like the beasts of the field, only a little more helpless. In foreign countries the idiot and imbecile population has not been allowed to perish without an attempt to improve it. Although the larger proportion of imbeciles is absolutely incapable of any culture, a very decent per-centage—at least thirty-five—have been found capable of making some intellectual progress, at least sufficient to raise them to a position superior to the level of mere animals, and in many cases to cultivate their dim in-

tellects sufficiently to enable them to help themselves. In England we have been somewhat behind-hand in these philanthropic efforts. The State has done nothing towards rescuing even the number that are capable of improvement out of the Slough of Despond in which they wallow in the pauper asylums throughout the country, and the work has been left, like so many other purely national objects, to be carried out by private charity.

Earlswood Asylum and Essex Hall are the only institutions in this country as yet which are employed in the labour of training the poor imbecile, so that he may at least not be a burden to others, and in many cases that he may become a very tolerable artisan or workwoman. We are all familiar with the building of Earlswood, as we pass it on our right hand at Redhill on the way to Brighton, even if we do not know the really Christian purpose for which it was built. The asylum, it may be stated, is not a mere receptacle for the helpless idiot—indeed, such are not eligible for admission within its walls—but only for those whose brains are sufficiently well-formed to be capable of receiving instruction. Thus the institution is a hospital, and not a mere receptacle for effete humanity, which cannot be improved by human aid, and which is therefore best left to the protection of the union.

The visitor to Earlswood need not fear to meet with any of those repulsive objects scarcely in human form whom he is apt to associate with the word idiot or imbecile. He may, therefore, enter without fear, and

witness one of the most interesting sights to be met with within the field of philanthropic labour. The majority of the children reared here are simply specimens of what is termed "arrested development." At a very early age the functions of the brain—at least in regard to its intellectual operations—appear to have stopped; hence we see a school full of grown-up boys and girls, sometimes of the age of eighteen or twenty, no more capable of taking care of themselves than children of three or four. They cannot use their hands in any ordinary operation; sometimes they don't know the way to eat with a knife and fork, and as a rule the new-comers are utterly incapable of dressing or undressing themselves. Their very actions are those of little children; their emotions and fears, their joys and sorrows remind us most forcibly of those we witness in a nursery of little ones. Here is singular raw material for the intelligent physician to work upon, and well does the physician perform his task. Dr. Down, the resident medical man, had to begin his task from the very beginning. The work of the nursery, which is sufficient to make the little one of ordinary intelligence an adept in small personal matters and attentions, has to be gone through with these bigger babies. The faculty of imitation, which is common to the monkey and to the child, is the great instrument by which these poor little ones are taught to exercise their senses, and to acquire the ordinary habits of civilised beings. They are grouped in classes, a few of those already instructed being mixed with those who have to learn. Finger

lessons are the first that are taught. Most of the children, for instance, on first admission cannot button a button, tie a string, nor do the commonest act which requires any adroit manipulation of the digits, hence all this has to be learned. It is certainly an odd sight to see a group of girls all actively engaged in buttoning and unbuttoning their clothes, in pinning them, and in tying and untying strings. In a short time, by watching those who are instructed in these simple arts, they become adepts, and are able to dress themselves with perfect ease. Whilst witnessing the mechanical manner and the earnest expression with which these lessons were performed, we confess we were reminded of the performing monkey the Italian organ-grinder carries about with him, who sweeps with a broom, plays the drum, shoulders and lets off a musket, and does half a score of tricks with equal adroitness. The use of the limbs is taught in classes in the same manner, the very exercise of volition giving immense pleasure to these little ones. Even the soundest-brained children flag in their attention if kept confined to one task too long, and to these imbeciles the faculty of attention is doled out in the most infinitesimal quantities, hence the necessity of constantly changing their occupations.

In all imbeciles the powers of speech are very imperfect; this arises in many cases not from any deficiency of the organs of speech, but from an inability to place the tongue and lips in a proper position to articulate. This is remedied by associating the children together in what is termed the "bell-ringing lesson." They

are taught to imitate the action of bell-ringing, and whilst in this manner exercising the organ of time, they are taught to sing in chorus some nursery song, such as "ding dong bell," &c. By this means the organs of speech are taught mobility, and in a short time that which they learn parrot-like they are able to repeat as an effort of will. By degrees those who entered the asylum incapable of any articulate speech, are taught by this method the use of their tongues.

To make workmen, however imperfect, out of the imbecile, there are a great many qualities beyond those we have mentioned necessary. They must have a tolerably accurate idea of form. This is a difficult thing to teach, but it is done by giving them lessons in fitting things together. Thus, one of the lessons is to place a number of square and oval pegs before the imbecile, and teach him to fit them into apertures of a corresponding character. This form of instruction is particularly useful to those who are intended to be taught carpentry. Various handicrafts are taught here, and therefore many preliminary lessons of a similar character have to be acquired before the boys are entrusted with tools. All the tailoring is done by the inmates, a regular teacher presiding, and instructing the more advanced in cutting out, sewing, and fitting. The workmen give the spectator, however, the idea of being boys at play, for they come up to him and eagerly show their work, as the youngest children show their drawings on a slate, delighted at the smallest praise. Besides the handicrafts, the boys are taught agricultural pur-

suits; they cultivate the garden, and feed the stock—the favourite occupation; they milk the cows, and do it well too. Five years is the term those are admitted for, who are upon the foundation, and by the time this period has expired very many of them are able to take part in the work of their homes, instead of being a mere incumbrance, often filthy and disgusting in their habits. The routine instruction of the asylum lifts all of these poor children, more or less, into the scale of rational beings, able to help themselves and others; but in some instances the most encouraging results are obtained. Thus, some of the lads are able to copy engravings in a surprising manner. It is done in a purely mechanical spirit, it is true, and this very fact affords a proof of the small intellectual merit of the merely copying capacity; but are there not many persons earning their bread in the world, and considered to be very clever, by means of the same limited powers? There is a lad here, however, who shows no mean constructive ability. Doctor Down discovered that he was fond of cutting out ships from the solid wood, and to encourage him, had him taken down to Woolwich Dockyard, where he witnessed the building of some vessels of war. The hint was sufficient for him: henceforth he disdained to cut his model out of wood, but set to work to build it up after the manner of a regular shipwright. He even made preliminary working drawings of the different sections, no mean intellectual effort, and from these drawings constructed his ship in a most workman-like manner. It is preserved as a trophy in

the asylum of the skill of the trained imbecile. Fired with this success, he determined to make a model of the Great Eastern, the most elaborate drawings for which we saw some time since laid down on the drawing-board, including some most mathematical-looking mid-ship sections, which few boys of much sounder intellect would be capable of drawing, much less of working by. For some reason, of which we have not been informed, this new venture has never been proceeded with; but he has constructed numerous models, which were exhibited in the Paris Exposition. Yet this young man appears to be infinitely below the level of many of the other inmates in general acquirements; he speaks with the utmost difficulty, and then but very imperfectly; and, when he can, he makes himself understood by a rude system of hieroglyphics, which he draws upon a board.

The girls, after they have conquered the preliminary difficulties of what we may term nursery instruction, are taught sewing and dressmaking, and have to take part in the household work, the greater portion of which they do under the direction of female trainers. It is a well-known fact that a far greater number of males are imbeciles than females, and all the worst cases of idiotcy and imbecility belong to the former sex; but in Earlswood, at least, there are no show girls that come up to the show boys in their intellectual efforts. We forgot to mention, among the latter, the boy with the wonderful memory, which he exercises in so surprising a manner, that if he had been of the out-

side world many persons would have thought him to be a remarkable prodigy. This lad goes through the History of England with the most extraordinary fluency, and with the utmost accuracy. But in some mysterious manner one link of facts seems to be so connected with the one following it, that when once he drops it his memory entirely fails him, and he is obliged to try back again until he picks it up once more. This is a proof of the purely mechanical nature of the process. Otherwise, he shows no quality above the average of the boys about him.

The value of associating imbeciles together, however great, as a means of teaching each other, was soon found by Doctor Down to have one serious drawback. The very fact of their being withdrawn from every-day association with the sane, deprive them of the power of self-reliance. They lived, in fact, in the narrow school of the asylum instead of the great school of the world, and it was accordingly found that when they went out they were as far as ever from being able to deal with the sane people from whose ways they had been withdrawn. Having their food and every other necessary found them every day, they lost the knowledge of the value of money ; they were ignorant of the commonest machinery by which the great world is carried on. To meet this patent deficiency a new system of instruction had to be adopted, and for this Doctor Down took a leaf out of the playing instincts of the nursery in the institution of "keeping shop." This is the most interesting sight, to our mind, of all the operations carried

on in the asylum. A room is fitted up as a general shop, with a counter furnished with weights and scales, and all the paraphernalia of a real counter. At the back there are drawers, in which are to be found all the miscellaneous collection of articles to be met with in such establishments. The names of the articles are written outside the drawers, and everything is complete, with the exception of the salesmen. The rows of seats which are ranged along one end of the room are speedily crowded with the lads, eager for the fun. A shopman is called for, and a score of boys volunteer. One is picked out, and then the instructor calls for a customer, and, of course, crowds offer themselves, and at last a lad is selected; and the little drama, played with real earnestness, commences by the buyer marching into the shop, when the shopman is expected to salute him politely, and if he does not he is reproved by the customer. We all know how strict children are when keeping shop; how they insist upon every act of the play being performed with the most undeviating regularity. It is exactly the same with these children of a larger growth but of a weaker brain. The play has doubtless, been performed so many times that they have it all by heart, nevertheless it is not the less interesting to watch it through its different stages. The real object of the little drama is to give the children an idea of the value of the articles they will be required to purchase in after life, and the use of the weights and scales. A regular higgling match forms the conclusion of the drama. An article is asked for, the weight

demanded, and a regular calculation is gone into. The quarrel about the right change to be given is very animated, the whole audience giving advice, or prompting when the chief actors are at fault. The instructor is present all the time, keeps order, and sees that the transaction is carried on in a fair and proper manner. There can be no doubt of the real value of this lesson taught under the guise of play, and the beauty of it is, that the poor brains of the actors and audience are relieved rather than fatigued by the performance. These exercises are a preliminary to the sending the boys outside the walls of the asylum on small errands, such as with letters to the post, &c. In this way the errors inherent to a strict asylum life are corrected.

Sometimes they are treated to real amusements, such as Punch, the lime-light, and the galanty show; by these means they are made familiar with the various animals and scenes existing in real life. They are presented, in short, with little pictures of the world, and of the relations different objects have to each other.

There are all classes of patients in the asylum, but they are by no means mingled. It is in fact, in one respect, like an hotel, where different accommodation can be obtained by paying for it. The first class of patients have their own private apartments and nurses, in a part of the building quite distinct from the other portion of the establishment; the next class, paying fees of thirty-five and fifty guineas, can associate with those who are elected on the foundation. All the

patients, however, go through the same system of training — not station, but intelligence forming the method of classification adopted. This question of rank does not in the slightest degree affect the children themselves, who are not cognisant of the differences of social standing; the poor man's son and the child of the rich one are going through their lessons side by side, in the happiest and most contented manner. What a pity it is that people with stronger brains cannot do the like.

A comparison of the condition of many of the imbeciles upon and some time after admission, is a measure of the real value of the training they have received. Those who know anything of the ways of imbeciles, must have noted their filthy habits, and their tendency to tear everything they can put their hands upon, their own clothes of course included. This tendency is utilised in a very ingenious manner; a fabric is put into their hands that requires picking to pieces, such, for example, as oakum. Of course they exercise their destructive tendencies upon it, but are surprised to find that instead of being scolded as they used to be, they receive kind words and thanks for their obedience. Thus the very first lesson they learn is that their new teachers are not inclined to kick and cuff them about, but to praise and speak kindly to them. The effect upon the new-comers, low as they may be in the scale of intelligence, is very marked, and it pretty generally secures at once their better feelings and their willing obedience.

We are not aware what the methods of instruction are at the only other asylum for imbeciles at Essex Hall, but we doubt if they can be better adapted to the purpose than those Doctor Down has, with so much intelligence and real knowledge of the true mental condition of these poor creatures, put in practice. It is just possible that thirty-five per cent. out of the fifteen thousand imbeciles in the country, may not be the limit to which a certain amount of instruction may be conveyed. We do not know, in fact, until we try, what depths of mental deficiency may not be redeemed by proper treatment, and it seems to us to be the duty of the State to test every imbecile before it throws him aside into the workhouse, as a piece of waste humanity, of no account in the great scheme. If the majority of these poor creatures were of the better class, there would be no fear that human skill would be brought into play to lift them from the mere animal life to which the mass of them are doomed, into the higher level of self-reliant beings—of a very inferior order it is true, but still vastly superior to the drivelling human abortions that now crowd our union workhouses.

THE MUSEUM AT THE COLLEGE OF SURGEONS.

With the exception of strictly professional men, possibly there are not a hundred persons in London who have visited the splendid Museum of the College of Surgeons. Sight-seers do not care to look upon a collection of bottles, and the most splendid assemblage of skeletons is nothing more to them than so many dry bones. To the thoughtful mind, however, whether belonging to the profession of medicine or not, the idea the great Hunter impressed upon this collection, first brought together by himself, is of the most intensely interesting character. The grand procession of life, from the humblest creature or plant, is followed step by step, and the links by which one class of living things is connected with that which succeeds it, is plainly set before the eyes of those who have eyes to see. The grasp of mind of the great surgeon, who thus sought to follow Nature into her innermost workings, and to show the machinery by which life in its various manifestations is conducted, must have been immense. The scheme he laid down was, in fact, far too great to be carried out by any

individual life; indeed, it is questionable whether any but the Great Architect himself would ever be able to take to pieces stone by stone, so to speak, the vast scheme of animated life. Year by year, however, the Hunterian Museum is becoming larger and larger, by reason of the labours of its successive curators; and it is undoubtedly at the present moment the finest collection of comparative anatomy, and affords the most ample field of physiological teaching in the world.

The first things that strike the eye of the visitor are the enormous skeletons of different animals that form vast cage-works of bone overhead and on either hand of him. There is the skeleton of a whale, for instance, which fills the upper half of a very long gallery. The length of this specimen cannot be less than seventy feet, and every bone is perfect, and articulated in the most exact manner. The mastodon and the hippopotamus can here also be seen in undress; and the elephant that went mad with the toothache, some years since, at Exeter Change, and was shot by a file of soldiers; the destructive nature of the volley they fired being evidenced in the gigantic skull of the brute. Among the most extraordinary additions to the collection in the way of rough sketches of this kind, is the skeleton, or rather the chief portions of the skeleton, of the dinornis, the wingless bird of Madagascar and New Zealand. This monstrous creature, in all probability, stood eighteen feet in height, and the most remarkable portion of its anatomy is that it is wingless. This gigantic bird is now supposed to be

extinct; at all events, it has never been seen alive, although it is within the bounds of possibility that it may still exist in the undiscovered parts of Madagascar. The existence of this strange creature was boldly proclaimed, some years since, amid the incredulous smiles of scientific men, by Professor Owen, from the bold generalisation he made from a few bones discovered in New Zealand.

The fact of this discovery of so large a creature, of which the world knew nothing half a century ago, gives strength to the belief that zoology may yet be enriched by the addition of many more animals when the interior of Africa, teeming as it does with strange beasts, is opened up to the world by scientific discoverers.

Although the skeletons of the larger animals in the collection strike the visitor the most forcibly, yet he has only to look into the glass cases to see that creatures of the minutest structure have equally attracted the attention of the anatomist. The humming-bird, scarcely bigger than a large fly; the tadpole, from its earliest growth; the whole range of the monkey tribe, up to the gigantic gorilla, all find a place here. And not only has the patient labour of the successive curators of the Museum, following and filling up the outline of the great Hunter, added link after link to the chain of animated life in these series of skeletons, but, entering more minutely into the field of comparative anatomy, they have given us side by side specimens of the various bones. Thus, one glass

case will be devoted to the scapulæ or blade-bones, another to the leg-bones, another to the feet-bones; in this manner the student of osteology is enabled to trace the most minute variations which exist in different organized beings according to the variations in their habits. And not only the bones, but the method of the arrangements of the muscles, of the nerves, and the sinews, and the blood-vessels in different animals, are clearly shown to us in the long array of bottles in which the specimens are preserved in spirit.

The general reader will, however, be better pleased, because he can better understand the specimens of the more curious matters to be seen in the Museum. The extraordinary accidents, for instance, to which the human body may be subjected, and yet survive, no person would believe, unless the evidence of science testified to the fact. When the poor bandsman was shot through the lungs the other day, his death in consequence was anticipated—and the anticipation, unfortunately, was justified by the event—by nine persons out of ten. Yet the passage of a small bullet through the chest, may well have given reason for a more hopeful result, when we look at the picture of an accident which happened some years since to a Prussian sailor named John Tozler. "Whilst guiding the pivot of the trysail mast into the main boom, the tackle gave way; the pivot passed obliquely through his body, apparently between the heart and the left lung." Not much, I fancy, would have been given for

the life of such a man by any insurance society. Nevertheless, John Tozler lived to laugh at the doctors, or rather to testify to their skill in bringing him through this terrible affliction; and I am told that after a voyage he comes to see his "accident" as depicted in the drawing, and is very proud of showing it to his shipmates.

The shaft of a chaise is also shown, from the fact of its having passed through the thorax of a certain Mr. Tipple—I trust the name is not suggestive of the cause of the accident. The shaft passed in under the left arm, and came out under the right arm. The man lived many years afterwards, and upon his death a preparation was made of his chest, showing the damage done to the chest and the lung, and the manner in which nature set to work to heal up the wound. John Tozler has promised, we hear, to dedicate his chest to the Museum after his death, always providing that he be not lost at sea. When this specimen arrives, the College will be unique in this class of treasure. The body of a healthy person is singularly able to bear up against overwhelming injuries, which would at once destroy the feeble. There are some people's stomachs, for instance, which are intolerant of anything in the shape of solid food; but among the specimens of abnormal matters found in the human stomach, is a mass of pins bent double; another stomach is full of clasp-knives, and even those were not too hard for the gastric juice, inasmuch as all the handles, composed of bone, are clearly seen to be dissolved, and the ironwork

was in a rapid process of decomposition, or oxidation, when death ensued. The stomach is sometimes found full of human hair. Young girls, suffering certain complaints, have a habit of swallowing hair, and in one instance here must have been killed by the habit, as there was no room left in it for the reception of food. Cows, in licking themselves, swallow great quantities of the same substance, which often form into large masses in their intestines. These morbid specimens are not very pleasant to contemplate. There is one small bottle among the thousands ranged in the department appropriated to morbid growths which possesses a certain interest, on account of the individual from whom it was taken. It is no less than the cancerous growth in the small intestine which carried off the conqueror of Jena. An examination made after the death of Napoleon at Saint Helena brought to light the small grey spot which conquered the great conqueror of nations. Many Frenchmen who have heard of the preparation visit the Museum of the College of Surgeons for the purpose of seeing it, and the page of the catalogue which refers to it is very much thumbed; but there is no allusion in the text to the great individual it slowly and silently brought to the dust. Neither is there any indication on the bottle that its contents are of any interest apart from its value in the chain of scientific facts which elucidate the progress of a certain form of disease. In the presence of the great conqueror, Death, the emperor and the hind stand on the same level. Some of the specimens of human

remains have a political and an antiquarian interest rather than a scientific one. Let us instance the specimens of human integument taken from the church doors of some of our ancient parish churches in Essex. Some of these pieces of skin, brown as the cover of an old book, were taken from pirates in the Anglo-Saxon times,—that is, fellows caught red-handed from their long galleys were flayed, and their integuments were forthwith nailed to the nearest church door, and there they remained for the better part of a thousand years, a terror to future marauders. A still more remarkable specimen of integument is that from a mammoth—a monstrous antediluvian pachyderm—discovered among the snows of the north of Siberia. Some time since this specimen of hide was considered unique. It is protected by a double covering of coarse hair, almost like thin whalebone, and an under covering of wool. Latterly, however, numbers of bodies of these vast animals have been discovered entire, iced by means of the overflow of seas of freezing mud, which appears suddenly to have overtaken these animals, and kept them there intact until some landslip once more exposed them to the human eye. Mr. Savile Lumley, the Russian Secretary of Embassy, in a report presented by him to Government, gives some most interesting details respecting these antediluvian creatures, whose ivory tusks form an item in the returns of the Siberian hunters to the Imperial Government. Mr. Lumley says, "Notwithstanding the enormous amount already carried away, the stores of fossil ivory do not

appear to diminish; in many places near the mouths of the great rivers flowing into the Arctic ocean, the bodies and tusks of these antediluvian pachyderms lie scattered about like the relics of a ploughed-up battle-field, while in other parts these creatures of a former world seem to have huddled together in herds, for protection against the sudden destruction that befell them, since their remains are found lying together in heaps." The extraordinary size of some of these mammoths may be gathered from the fact that as many as ten of these tusks have been found lying together, weighing from one hundred and fifty to three hundred pounds each; they are so heavy that they cannot be carried away, and have to be sawn up into slabs on the spot. These tusks are much heavier than those of the largest elephant; the size of this antediluvian monster must, therefore, have been vaster than that of any animal now existing. Read by the light of those recent discoveries, the specimen of integument in the Museum acquires additional interest.

Hunter was always on the look-out for the exceptional developments of humanity, and he had a special eye for giants. O'Brien, the young Irish giant, who died in his early youth, fell into the hands of the great anatomist after his death, notwithstanding the precautions taken by the dying man to escape the fate which he feared awaited him, for Hunter had long "marked him down" as his own. In order to prevent his remains being "anatomised," he gave directions

that they should be sunk into the sea. But it was vain to struggle against the scientific ardour of Hunter, who managed to bribe the persons appointed to watch over the body, and for a sum of eight hundred pounds they delivered it up to the anatomist, who immediately took it in his carriage to his house at "Earl's Court," and dismembered and boiled it forthwith, knowing the rage that would fill the minds of the giant's fellow-countrymen when they discovered the abstraction of the body. The skeleton of Freeman, the American pugilist, is to be seen in the same glass case, and the powerful frame of another man, famous—or rather infamous—in the annals of the Newgate Calendar, that of Jonathan Wild, the thief-catcher, who was hung at Tyburn in 1725. Giants rarely live long; their frames seem more open to the inroads of disease than those of more moderately-sized men, the chest being generally their weak point. There is, we believe, no example in history of a man above seven feet in height living to anything like the ordinary span of life. Neither, on the other hand, do deformed persons, for more obvious reasons, attain length of years. The Siamese Twins died early. There is a cast in the Museum of the manner in which the chests of the twins were connected. In a dark recess of one of the rooms, as though it had been placed there furtively by the curator, is the embalmed body of the wife of Mr. Van Buchell. This quack adopted this method of preserving his wife above-ground, in order to attract visitors, and patients in their train, to his

house. It appears either that the sight of the embalmed woman inconvenienced him by the crowds it drew to his doors, or that he pretended it did, in order to excite public attention—most probably the latter—for attached to the body is a slip cut from the *St. James's Chronicle* of October the 21st, 1773, to the following effect:—"Van Buchell (not wishing to be unfortunately circumstanced, and wishing to convince some minds that they have been misinformed) acquaints the curious that no stranger can see his embalmed wife, unless (by a friend personally) introduced to himself any day between nine and one, Sundays excepted." Was this a dodge to make the personal acquaintance of curious people for professional purposes? The strange liking exhibited in many classes of life for keeping the bodies of friends above-ground, is noteworthy. Jeremy Bentham was embalmed, dressed in his ordinary clothes, seated in a natural position in his arm-chair, and may now be seen in the flesh in one of his friends' houses. What was an exceptional and passing taste in the last century among ourselves, was a constant rule among the Peruvians at one time. Then the dead were generally dried in a crouching position, and stacked away like so many stock-fish.

The vast wealth of this collection, however, lies not in those matters which afford wonder for the merely curious, but in preparations, dried and in spirits, which have been increased year by year until they now number thirty thousand. In Hunter's time they did not reach eleven thousand, but it has since been the

habit of all anatomists and surgeons of any note to present preparations of any cases which illustrate particular points in morbid anatomy. By reason of these free gifts, the Museum has been very nearly trebled without the cost of one penny to the nation. John Hunter lived so entirely for science, that when he died it was found his property (with the exception of his collection) was not more than sufficient to pay his debts. Under these circumstances, we are told by his biographer, it was determined to appeal to the Prime Minister to purchase the collection on behalf of the nation. William Pitt, although a very great minister, was but little of a philosopher, and on application being made to him by Hunter's friends for a grant he replied, "What, give twenty thousand pounds for bottles? We want the money to buy gunpowder." Thus, what was begrudged to the service of science labouring to save human life, flowed freely enough to provide the means of destroying it. Ultimately, after much badgering of successive ministries, the Museum was purchased for the nation. But the most important legacy of all left by Hunter, as he trusted, doubtless, to the tender care of posterity, never saw the light at all. The ten folio volumes which contained the notes of all the observations he had made in comparative anatomy, and without which his collection was like so much matter without mind, he bequeathed to his brother-in-law and late assistant, Sir Everard Home, to whom their editorship was entrusted by his colleagues. Years passed over, and still the manuscript was never forth-

coming. Meanwhile, however, Sir Everard Home continued to pour forth paper after paper at the Royal Society on comparative anatomy and physiology. Pressed, at last, to say what had become of Hunter's papers, he owned that he had burned them; the object being, in the opinion of those best able to judge, to hide from the world the source from which his own papers had emanated. Had Hunter's manuscripts come to light ungarbled by his friend, the science he laboured so long to illustrate and illuminate would, without doubt, have greatly enlarged its boundaries. The Museum is now full to overflowing, and for the specimens the future shall bring forth it will be necessary to enlarge the building. As it is, however, the materials existing in it are ample, and they only require the generalising brain of a second Hunter to connect, in one grand chain, the numerous links furnished by the founder of the Museum and his successors.

THE CITY COMPANIES.

It seems strange to find dotted about the heart of the City of London, remnants of old trading guilds that have come down to us from the past centuries—to meet the forms, if we may so speak, of a group of trades unions still present with us in the flesh, although departed in the spirit, which significantly point to the narrow way in which commerce was carried on in past times. The City companies, chartered and fenced about with many privileges, represented for ages bodies of traders who bound themselves together to protect what they imagined to be their own particular interests, pretty much in the spirit of the trade societies of the present day.

In various parts of the City are still to be seen fine old mansions that once formed the centres of these powerful communities—the Halls, as they are termed, of the companies. Of these the more important are known as the twelve great companies, although there are in reality eighty-two; but the twelve possessing large revenues, and commanding ample patronage, are the only ones that may be said to possess social or political influence. These are known as the Mercers,

Grocers, Drapers, Fishmongers, Goldsmiths, Skinners, Merchant Taylors, Haberdashers, Salters, Ironmongers, Vintners, and Clothworkers. Many of these companies, whilst they have been gradually perishing in trading influence, have year by year been increasing in wealth, owing to the enormous rise in value of their estates and house property in the City; hence they are not likely to die, albeit the old occupation for which they were founded is gone. So rich have many of them become that the only way they can get rid of their superfluous funds, seemingly, is to rebuild their halls on a scale of great magnificence: witness the splendid buildings now rising in Broad Street belonging to the Drapers' Company, the Fishmongers' Hall on London Bridge, and the Goldsmiths' Hall behind the Post Office. It is true, nearly all the powerful City companies' halls were demolished in the great fire of 1666; but that is not so long ago, that the buildings which arose from their ashes were not quite sufficient for the trading purposes of the different companies they housed. But these wealthy bodies are determined, we suppose, to show that they are architecturally and gastronomically in existence, however obsolete they may be in other respects. In many of the companies there does not exist a single person of the trade represented by the hall. For instance, the great Mercers' Company does not contain a single mercer, and possibly there is not a veritable fishmonger to be met with among the livery of the Fishmongers. The Spectacle Makers are notoriously filled with politicians and great City mag-

nates who wish to possess the freedom of the City. There are several of the companies which still possess certain trading privileges, which give them some vitality in a commercial sense. For instance, the Goldsmiths require their hall mark to be stamped upon all the gold and silver articles manufactured; the Gunsmiths, again, possess the right of testing all the guns made in the City of London; and the Apothecaries' Company not only sells drugs in its Hall, but possesses the right—although we never hear of its exercising it—of entering any chemist's shop within its jurisdiction, and of testing the drugs for the purpose of discovering adulterations—a most important power, which it would be advisable to put in practice. This company also examines students for the apothecary's licence. The Stationers' Company is another association still retaining the very important privilege of registering copyrights. How inefficiently they perform this duty in everything but the matter of taking fees was shown some time since by Mr. Moy Thomas in the *Athenæum*.

Of old, however, all the companies exercised almost unlimited power over their respective crafts. Their halls were not merely places of festive gatherings, as now, but the seats of government of every detail relating to the trade they represented; and it may be here remarked that they kept up the most rigid distinction between the different crafts. The idea of a general shop, in which everything was sold, would have struck the masters of the old companies as one that led to chaos. A draper, when the companies were companies,

would not have dared to sell mercery, neither would the beerseller have been allowed to vend wine, nor the grocer that article, as they both do now. Each trade was a caste, if we may so term it, and was as strictly kept apart. The crafts in those days were generally located in their own particular streets. The Mercers and Haberdashers kept to Westcheap, the Fishmongers were to be found in Tower Street and Fish Street Hill, and the Brewers kept near the Thames—as they do now, indeed, for an obvious reason. We do not see why the fripperers and upholsterers should have made Ludgate Hill their special mart. The exclusiveness of these old craftsmen was in accordance with the spirit of the times; it is singular to remark, however, that the same narrow spirit of the past still shows itself in these free-trade days among the barristers, the stockbrokers, and other exclusive professions, as well as among the trade societies, who will not allow a bricklayer to do the work of a plasterer, or a carpenter to do the work of a bricklayer, or a hodman to carry more than eight bricks in his hod at one time.

Of old the officers of these different crafts exercised one privilege which was for the benefit of the whole community—they endeavoured to prevent adulteration. They regularly went their rounds to see that weights and measures were up to the standard; and the Drapers and Merchant Taylors still keep in their halls, as memorials of the past we suppose, standards or yard measures, of silver, which were taken to the City fairs, and used to measure off every man's bales, in order to

see if they contained the right quantity. In the old days, the silver "standard" would have discovered the disreputable trick of a short measure, and the proprietor would have been heavily fined. It is on record that the famous Sir Richard Whittington was a terror to dishonest brewers. Herbert, in his History of the Companies, gives the following entry from the books of this craft:—"On Thursday, July 30th, 1422, Robert Chichele sent for the masters and twelve of the most worthy of our company to appear at the Guildhall; to whom John Fray, the Recorder, objected a breach of government, for which twenty pounds should be forfeited for selling dear ale. After much dispute about the price and quality of malt, whereon 'Whityngton,' the late mayor, declared 'that the brewers had ridden into the country and forestalled the malt, to raise its price,' they were convicted in the penalty of twenty pounds; which objecting to, the masters were ordered to be kept in prison in the Chamberlain's custody until they should pay it, or find security for the payment thereof." What would old Whittington have said to the publicans' trick in these days of buying up bitter beer bottles with special trade-marks upon them, and then filling them with inferior Burton at bitter beer charges?

Although there was much superintendence, some good and some bad, yet the main pleasure of these City worthies in the old days, as now, was giving good entertainments. Most of the old halls before the great fire were either the deserted houses of the aristocracy, or the monastic or conventual buildings that were seized

by the Crown after the Reformation. Thus the Grocers settled themselves in the town house of Lord Fitzwalter, and the Drapers possessed the mansion of Lord Cromwell; the Salters' Hall once belonged to the Earl of Oxford; the Leathersellers purchased the nunnery of Saint Helens, and the Pinners obtained the Austin Friars' Hall. Within these roomy and picturesque mansions there was plenty of space for display, which our ancestors so much loved. In those days there was time to live and to enjoy the things of this life. Hurry and drive were terms then unknown. The chief magistrate was always chosen from among the leading men of one or other of the great companies; and, as there was no special Mansion House, they always did the hospitalities of the mayoralty in the hall of the company to which they belonged. But the mere official displays appertaining to the office of chief magistrate formed but a small portion of the occasions for municipal festivity and jollity which the citizens of old indulged in.

The records they have left us prove that City men of the olden time never lost an opportunity of making some grand display. On the occasion of any royal presence in the City, such as the entrance of Henry the Fifth after the famous battle of Agincourt, and the entry of Henry the Seventh after the battle of Bosworth, the members of the companies all turned out to receive the monarchs with great honour, and with grand scenic display. It is difficult to conceive, in these days of drab, the City of London putting on a par-

ticularly bright appearance; but in times of yore, it must be remembered, there were costume and colour enough in England to satisfy any pre-Raphaelite. The liveries of the different companies were all bright and diverse; in 1414 that of the Grocers was scarlet and green, at other times it was murrey and plunket, or dark red and blue; the Drapers' was violet in grain, with crimson bands, green, sanguine or blood colour, and cloth striped with rays. The staid citizens, on such occasions, must have resembled gay carnival-keepers, such as we see in Italy, rather than the spectacle afforded in modern times even by holiday-keeping Englishmen. There was a very general custom of what was termed "riding out against" grand personages in those days—in other words, the companies, in all their bravery, proceeded in grand cavalcade to meet their visitors. Then there were the imposing funerals that took place on the death of any particularly famous members of the craft. During the Catholic times, religion was most intimately mixed up with these ceremonies, and, we may say, feasting also. When Sir Thomas Lovell died, there was a grand procession, all the livery bearing tapers, and all the solemnities of the Church being called into requisition to give impressiveness to the occasion. Sir Thomas, the same that built Lincoln's Inn gateway, was buried at Holywell Nunnery, Shoreditch. We cannot imagine anything interesting in the matter of pageantry connected with such a locality in these days, but three hundred years ago Shoreditch was a very different place to what it is

now. We are told by Herbert that on this occasion "there was a drynkynge-in in all the cloisters, the nuns' hall, the parlour of the same place, and everywhere else, for as many as could come, as well the crafts of London as gentlemen of the Inns of Court." Not only were great men's funerals conducted in this manner, but every member of the livery was carried to his last resting-place with religious observances of a more or less impressive character, the mortuary priest, one of whom was an important member of every craft, saying so many obits over his remains for ever. Every company had a state pall of the most gorgeous character. One of these, belonging to the Fishmongers' Company, is still preserved as one of the most interesting sights they have to show. Instead of the meagre black and white now in use, the pall was worked in massive pictures of the saints and angels embroidered in gold and the most brilliant colours. To the present day it remains, a splendid example of magnificent work of our ancestors. When the Reformation took place, the money left by members of the craft for the maintenance of obits was seized by the Crown, and, of course, very large sums left for that purpose were lost to the companies for ever.

But it was in life, equally with death, that the munificence of our ancestors was shown forth. The fine ceremony of setting the Midsummer Watch—the civic watch for the protection of the City—was the grand annual occasion for display. On this occasion every company turned out its contingent to enhance

the display; and we can imagine the narrow streets of that period hung with tapestry, one blaze of colour, the windows resplendent with fair dames, prepared to greet the grand procession as it passed along.

In these days a Lord Mayor's pageant is a miserable exhibition. Till lately, tawdry finery and ridiculous gilded coaches traversed the City and West End, accompanied by a score of bands of music all playing together, without the slightest reference to time or tune. By the side of these a band of ruffians, the terror of the shopkeepers, rushed, like wild barbarians in advance, plundering every one they came across. The gilt coaches were last year given up, and no wonder that we find letters in the papers recommending the entire abolition of the old-world finery. Of old, however, the procession was managed with decorum, and with some poetical feeling. In those times the getting up of these processions was given to true artists —poets and architects composed the pageants and displays. Lord Mayors were treated with special entertainments in their passage along the streets. When Sir Thomas Middleton was elected mayor in 1613, the water pageant was truly picturesque: it did not consist merely of the gilded barges which we were all familiar with a few years ago, but there was a pageant of "five islands, furnished with all manner of Indian fruit trees, precious drugs, and the like, the middle island having a fair castle especially beautiful." These islands were planted on boats, and referred to the forts of the East India Company, then lately established.

We may not care about glorifying our East India possessions, albeit a thousand times more important now than they were in that day; nevertheless, we think the water procession was very unwisely abandoned, and we should not feel surprised if the City authorities were to revert to the old custom, for the sake of shaking off the "rough" element attending the procession through Fleet Street, the Strand, and Westminster.

The companies, from their known wealth, were from an early date looked upon as so many sponges to be squeezed at times to supply our kings in their necessities. Henry the Eighth, when he wanted money to carry on his Scotch wars, made large demands upon them. Elizabeth called for both men and money to repel the Spanish Armada, and was nobly supplied by the companies. In the civil wars they were not so amenable to the kingly power; they mainly tended to its overthrow, indeed, by sending down ten thousand of their train bands to the relief of the siege of Gloucester, which was the military stroke which decided the fate of despotism in this country. Nevertheless, on the accession of Charles the Second, the companies became abundantly loyal, and Pepys tells us of many a grand banqueting that took place there in the days of the Merry Monarch. The great fire, it is true, swept away all the old historic halls. They were steadily rebuilt; but the mediævalism of the past departed from them—the chain that bound them to the old historical glories was gone; they lost most of their old plate; the pageants kept in the roofs of the old halls, and which

were let up and down when required, were destroyed, and the picturesque element departed from them. Indeed, their usefulness was gradually passing away with the free air that was setting in, and with the landing of the Prince of Orange their occupation might have been said to have gone. Notwithstanding the immense losses the different companies sustained in consequence of forced loans and the great fire, possibly their landed and house property never was so valuable as it is at the present moment. They possess some noble charities and educational establishments; nevertheless, we should not feel surprised if ere long the Government were to interfere, and withdraw the vast funds of these companies from their present management, and dispose of them in a manner more in accordance with the tastes and usages of the present day. It would, perhaps, be ungracious to inquire how much of these funds are dissipated in mere dinners and banquets, but we do not doubt that vast sums—far more than was ever anticipated by those who bequeathed them—are so squandered, and the community certainly would not regret if such a misdirection of the funds were put a stop to.

STARVED BY THE BUTCHERS.

For these five years, it would appear as though our bodies were entirely in the hands of the butchers—they are the masters of the situation. Our graziers may grow meat, our steam marine may bring it from abroad and from distant parts of our own country, but the butchers say, No, you shall not have it except at our own prices. During the height of the cattle plague, there was some reason for the high price of beef at all events, but far less than the burly gentlemen in the blue aprons attempted to make us believe. Considering the enormous herds in the three kingdoms, the per-centage of deaths from this cause was really trifling, not more than five per cent., as we know officially. This certainly could not justify the very high prices asked with a painful uniformity by the West-end butchers. This great city is like a garrison, which has placed the keys of the provision store in the hands of a few individuals, who combine together to let no food out except on their own terms. It really seemed as though our boasted principle of competition had broken down, and we were beginning to believe that there was something in the French method better

than our own. But the fault really lay with ourselves: we were too patient—so much so, that we deserved to be fleeced. All that is now changed. When men find they cannot get enough to eat, they are apt to rebel; and the public, at all events, find they can combine as well as the butchers. There has long been an idea abroad that there are too many steps between the producer and the consumer, and, a profit having to be made in each step of the process, prices have in this way been immensely increased, independently of natural causes. Hence we see the rise of co-operative stores, which get rid of the retailer. The co-operative principle has been introduced into the meat trade, and we find that some enterprising railway companies have inaugurated an undertaking which has had a very important effect in lowering prices. The cattle plague, dire nuisance as it was, overturning the movements of the whole trade, has happily resulted in a reform in the West of England, which we trust will spread over the whole land.

The prohibition issued by the Order in Council against the carrying of live stock by railway bore particularly hard upon the Bristol and Exeter Railway, inasmuch as a large portion of the Company's income was derived from this source. The people of the large towns of the West, especially Clifton and Bristol, also suffered by the increase of the price of meat. Under these circumstances, the directors determined to turn traders themselves. They started a Company, termed, The West of England Produce Company, which they

made known to all the farmers and graziers down their line. They opened special places at their different stations for the reception of meat, and they fitted up trucks like shambles. There were the regular hooks and appliances, and the meat, when the doors of the trucks were opened, presented all the appearance of a butcher's market. These trucks were shunted into a goods' shed, and a market was thus improvised every appointed day. They have also opened what they term the West of England Agricultural Stores, in the immediate vicinity of the Exeter Railway terminus, New Cut, Bristol; and this store still continues, and is greatly patronised by all classes in Bristol and Clifton. Families will club together to buy a sheep, and prices have fallen at least twopence-halfpenny a pound in that city in consequence of this competition.

What has so long been desired has at length been obtained—a direct communication between the farmer and grazier and the consumer. The dealer and the butcher have been dispensed with, and their profits have therefore been deducted from the price of the meat. The scheme has taken amazingly with the farmers, and the railroad, of course, has greatly benefited by an arrangement which the directors were bold enough to inaugurate. The experience gained in the West of England has been keenly watched by capitalists and railway directors in London, and we should not be surprised to find markets both for vegetables and meat opened close to the different rail-

way termini. The want of markets to control the retailers in these commodities, and especially in the matter of fish, is greatly felt in every part of the metropolis. It is disgraceful that such places should only exist in any adequate proportion at the east end of the metropolis; it is equally wasteful, as a principle of social economy, that the prices of food should be so greatly enhanced by the carting away of such produce to retail dealers, who in return cart it to the doors of the purchasers. Those who can afford to pay the prices tradesmen are obliged to charge for all this horse conveyance may do so; but the poor, and, indeed, those of moderate incomes, cannot, and the municipal authorities are neglecting their duty in compelling them to do so by not opening markets as close as possible to railway termini, even supposing the directors do not care to provide them. Those accustomed to provincial life are, on first arriving in London, astonished to find the carts of the tradesmen do for families what the families in country towns do for themselves. On market days the housekeeper, or the ladies of the household, have a regular practice of making their own bargains in the open market, the servant following with the basket and taking the purchases home, or they employ a basket-woman for that purpose. In London such things are unknown, except to a very few persons. The reason is obvious: housekeepers cannot market if there are no markets at hand, and they have to buy "through the nose"—paying, with respect to vegetables, at least a hundred per cent. more than they should do—in con-

sequence of this great want. The Society of Arts have been inquiring into this question of markets, and have been receiving evidence respecting it, which will be found reported in their journal. But the time has passed for a mere discussion of the propriety of their establishment, the public have made up their mind that they shall be established. Why should the whole of London be confined for fish to Billingsgate, a market sufficient for a town of thirty thousand inhabitants and no more? The whole of the fish received does not come by water, nor indeed the larger portion of it. There is not a railway that penetrates to the sea coast, and has a terminus in London, that does not bring day by day very large supplies of fish. Why all this excellent food should be taken off to Billingsgate to be removed to every quarter of the city again, is one of those things that can only be ascribed to the blundering of our municipal administration. It is the same with vegetables, which mainly come from the west to go east, to return again west. With meat the like perversity of carriage is adopted. By far the largest supply of dead meat received in London comes up by rail from Aberdeen, and is received at the terminus of the Great Northern Railway at King's Cross. What a gain it would be to the whole of the north of London if a market were constructed in this neighbourhood, with a siding from the line right into it. At the present moment, the whole process of distributing the food our various railways pour into the suburbs every morning is in a disgraceful state of

chaos. We may boast as we like of our liberty, and of the value of freedom of trade, but as far as the machinery for that liberty is afforded by our municipalities, we are ages behind the French, and the sooner we admit the fact the better. What, we may ask, is the Board of Works about, that they have taken no steps to distribute economically this food by the establishment of what may be termed peripheral markets at the termini of the great roads leading from the country? If they had only been half as busy in giving us free access to food, as they have been in pouring into the Thames the means of growing it—namely, the sewage-manure of this great metropolis, which they have wastefully thrown away instead of placing it on the land—the public would have been indeed gainers.

We took a long journey into the Whitechapel Road the other day, to note the success of "The People's Market," a venture of a private Company. It was Saturday, and the crowd of people was so great that the persons marketing were obliged to move in procession as it were, entering at one door and returning by another. The attraction was the cheap rate at which the meat was being vended. "Yer ye are; shoulders at fivepence, and legs at sixpence," shouted the chapman. This, to a West-ender accustomed to pay tenpence and elevenpence, was certainly startling. The joints were, it is true, not first-class meat, but were decidedly good meat, and fit for the table of any man not over fastidious. On inquiry, we found it to be

Dutch mutton, a very large supply of which is now furnished to our markets. It comes over in carcase during the cool weather, and in the summer the live meat is brought by steamer. Many as are the advantages of bringing the meat to London in the carcase instead of alive, there is one drawback to the system which tells hardly upon the very poor. The liver and lights, and the hearts, heads, and trotters, are not of course brought with the carcases, and these portions of the sheep form a very large amount of the food of the working classes. If the trade in future is to be a dead meat trade, some means of bringing these portions of the animal to the metropolitan markets must be adopted, otherwise the working population will be no gainers by a reform which will otherwise be very acceptable to the middle class, and which will sweep away those nests of filth and fever, the slaughter-houses. When this Dutch-fed mutton first came over to this country, it was very poor thin stuff; but the market for it proving good, more attention has been paid to its growth, and now it arrives in very good condition—indeed, if anything, a little too fat. Beef was being sold at sevenpence—not so bad in these dear days; groceries, cheese, and bacon, suited to the pockets of the labouring classes, were also meeting with a large sale. The secret of the low scale of prices obtaining in this new market, is that the Company purchases direct from the grower, where meat is concerned, in large quantities, and from the brokers at first hand where dry goods, such as groceries, are in question. The

proprietors have fitted up soup-boilers within the market, where they intend to sell good strong soup at twopence a quart, and a plate of curried meat, enough for a man's dinner, for the same money. Here we found stores of preserved meat from Australia, excellent beef, such as is served out to the sailors in our fleet. Very large quantities of this food is now finding its way from the other side of the globe. It is found that to send meat pays better than to boil down beasts for the sake of their tallow. A very large trade is expected in a new article of food—mutton hams, cured in exactly the same manner as the ordinary hams. They are exceedingly nice, and the simplicity with which they are cured will enable them to be sold at a very moderate rate. In the countries bordering the River Plate, there is a limitless supply of both beef and mutton; the latter can be bought at a penny per pound, and the beef is even cheaper. We can dry the latter, and make hams of the former; and get enough of them over to feed the whole working population of these islands at less than half the price that is now being paid for far inferior meat. But without going so far as the antipodes or South America, we are opening up ample stores of fresh meat in countries nearer home. Large quantities of excellent beef come from Holstein and Denmark; Scotland is sending us a far larger supply of excellent mutton than we produce ourselves; and even from Cornwall heavy van-loads of meat are daily arriving in the metropolis. The famous South Down mutton, once the main supply of London,

now only forms a small per-centage of that which is daily consumed.

The butchers, by their foolish combination to keep up prices, have brought the provision factors into the market against them. It is as common now to see mutton and pork in their shop as ham or bacon; indeed, many of the suburban shops are greatly underselling the butcher, and taking away his trade, and they are invading the domain of the poulterer also, selling large quantities of Ostend rabbits by the pound.

It is a very noticeable fact that the hard line which divided one tradesman from another is now breaking down. The barrier seems to have been first removed by the grocer, who turned wine merchant, much to the dismay of the publican, with whose fiery sherry and treacly port trade it interfered. Boniface has now turned the tables, and advertises beside his best gin excellent tea at two shillings and sixpence, and even the wholesale wine merchants have been going into the China trade, and are placarding the omnibuses to that effect. What next, and next? We remember, once, seeing in a large provincial city a silk-mercer one morning take down his shutters and astonish the public by exposing to view a shop window full of Welsh ponies. A strange contrast this to the ordinary run of goods in a mercer's establishment. But once the line that restricts a tradesman to a special article is departed from, we may expect a universal "bouleversement" to follow.

Nearly every day there is a glut of some kind of

food or another in London. Either the mackerel boats or the sprat fleet arrive, and if it were not for a class of men that the Metropolitan Street Traffic Act, as originally passed, bore very hard upon lately—namely, the costermongers, of whom we have recently spoken —valuable stores would be wasted, as far as human food is concerned. There are between twenty and thirty thousand of these useful men always on the look-out for any superfluous supply of food to the markets. When the sprat season first commences, they are to be seen in thousands at Billingsgate viewing samples of the fish as they are turned over in the holds of the vessels before they purchase. Were it not for these itinerant dealers, who, with their barrows, penetrate into every lane and alley of the metropolis, the very poor would be deprived of this wholesome food. At other times herrings overcrowd the market, but the costers are speedily at hand to distribute them. The vegetable market is watched by these active fellows quite as narrowly, and fruit that would otherwise perish is passed on to the consumer with a remarkable rapidity. Had these men been hunted from the streets by the late ill-considered and, in some particulars, mischievous Act, a very great injury would have been inflicted upon the poorer classes to whom those men are purveyors, and an enormous amount of food would have been wasted. Why these poor fellows should be interdicted from using the public streets with their barrows, whilst the tradesman, with his horse and cart, is allowed to linger as long as he likes at the kerb-

stone, is a thing that neither the public nor the coster himself could make out. Possibly there is no class of men that work so hard for a small return as these poor fellows. They rise long before daylight to attend the early markets, and they are to be seen long after the workman has gone home to bed traversing the crowded thoroughfares of Whitechapel and the New Cut, having done a harder day's work, in all weathers, than the vast majority of well-paid artisans. If they submit to such drudgery rather than go into the workhouses, surely they are worthy of better treatment than our Legislature, in its haste, would give them.

Happily, however, the Home Secretary has been persuaded to hang up the clauses that affected the coster, until the Parliament has time to re-consider them after the recess. If by hard treatment we alienate the good feeling of these men, we shall certainly add fuel to the Fenian element; and we may, perchance, have a riot that we may not be able to quell very easily.

ICE CROPS.

It seems strange to talk of crops of ice, but crops they are in the true sense of the word, and very valuable ones to our American cousins. In this country, where we only occasionally take an ice, and never think of touching it in the winter, this material is not such a necessity as it is in America, where its use has become a habit, and where in the hardest frost the Yankee will call for his julep with a lump of ice in it. This seems to us rather too much of a good thing, but habit is second nature, and our American cousin no doubt thinks our plan of taking a dram hot and strong quite as odd as his tendency to take everything cold.

But to return again to the ice crops. A lake of spring water near the seaboard in the United States is far more valuable than any farm of the same size. As long as the hard frost lasts, when all agricultural pursuits are out of the question, the solid waters are successively reaped, allowed to grow, and reaped again, when every other crop is hidden in the frozen ground. The most celebrated of these ice farms is situated a short distance from the city of Boston, and when the winter sets in, the scene upon its frozen surface is most

exciting. Like other crops, ice depends upon the season. A rapid thaw will throw all the operations of the icemen out of gear; a fall of snow, and a subsequent thaw, will entail upon him much hard and profitless labour. What he requires is a still day, with the thermometer twenty degrees below zero. Then the hands make ready the ice-plough, and set to work. The first step in reaping the ice crop is to run the sharp ice-plough along the surface in a line, marking out a square of three or four acres. This line is cut a few inches deep, and is used as a guide for another plough, drawn by horses, called the marker. The machine cuts two parallel lines about twenty-one inches apart; other parallel lines are drawn at the same distance in a similar manner. When the whole space has been thus ruled in a parallel direction one way, the process is repeated at right angles until the surface of the ice is divided into squares of twenty-one inches superficies by about one foot deep, the depth of congelation at which the process of gathering the crop is generally commenced.

The first squares to form an opening are sawn out, and the rest are then rapidly detached by means of the ice-spade, made in the shape of a wedge, which splits off the ice blocks by its weight when dropped into the groove. As these cubes of crystal float off from the plain of ice, they are landed by being slid up an inclined plane which dips down into the water; a peculiar jerk given by the iceman with an ice-hook sending them spinning with a musical humming sound

until they gain the level. When a sufficient quantity are landed, they are removed in sledges to the ice-stores located beside the lake, shifted on to an ascending platform, and lifted by horse power in an ascending frame to a stage, from which they are tilted to a place prepared for them. These ice-houses are prepared to store the crop until it requires to be shipped. They are, in fact, gigantic refrigerators, so constructed as to present a non-conducting medium between the ice and the outer air. For this purpose the walls are built of pine, two feet apart, and the space between is well rammed in with sawdust; the roof is protected against the outer air in the same manner. The ice-house, thus cheaply constructed, withstands the fiercest heats of summer, holding its glittering prisoners through the long dry days without much waste from thawing. In unfavourable weather, such as a snow storm, followed by a rapid thaw, the surface is spoiled by the formation of snow ice, which is worthless, and the whole of it has to be planed off until the solid block ice is reached below; then the process of cutting into cubes is proceeded with as before stated.

The chief loss by thawing is experienced whilst it is on shipboard. It is placed in the hold amid a packing of sawdust, but the sea air is so active as a thawing agent, that this non-conducting medium soon becomes saturated with the water, a proper drainage for which cannot well be managed. The consequence is a more rapid thaw as the saturation becomes more complete. The loss at present is at least one-third of the cargo

whilst on its passage in a sailing-vessel from Boston to England. The remedy would be to employ steam-vessels, which would make the voyage in a third of the average time of sailing-vessels. With this power on board, nothing would be easier than to keep the ship dry. The stores of American ice are preserved in the same method here as in America. Now and then we see barges proceeding up the river full of huge crystal blocks, to the storage warehouse of the Company. It seems to surprise the spectators that so little of the ice melts, even under the influence of a mild sunny spring day; but it is protected by its form, which presents the smallest possible surface to the surrounding air. The thaw can only proceed from its six sides, the whole of the interior of the mass remaining at its own temperature. A block broken into pieces would thaw in the course of a few hours, whereas one of these cubes will remain for weeks fully exposed in the shop-window of the ice-stores before it is wholly deliquesced. The demand is so large for the article in the United States, that we wonder Companies are not formed to farm the ice-crop of Norway, which is so much nearer Europe. Cargoes, it is true, do occasionally come from that country, but the full advantage of the crop cannot be derived until its harvesting becomes a regular industry, as it is across the Atlantic. Our own Scottish lakes would seem to be eligible for this industry, but there is a necessity that the lake should be near the seaboard. Moreover, as pure spring water is necessary to produce ice such as may be used in

beverages, stronger frosts than are customary in the Highlands are necessary for its production in sufficiently thick blocks.

Since the price of ice has fallen so much, it is used not only as a luxury at the table, but also as a means of preserving food in the very hot weather. It is not an uncommon thing to find a large block of ice in butchers' shops in the dog days, the mere presence of which sends down the thermometer many degrees. Fishmongers also use it in their stores very largely. For the rough purposes of freezing, the old pond ice of home-growth is still in use, but this dirty material is now wholly banished from the dinner-table. It is difficult to entertain the idea that twenty years ago any ice—that from the Thames and the park lakes, with all their impurities—was used to cool our claret.

In India the intense heat is made to act as a freezing agent. The native wraps a cloth round his porous bottle, sprinkles it with water, and the rapid evaporation which takes place is sufficient not only to cool the contained liquid or solid, but to cover it with a coating of ice. If it were not for this luxury, life in the tropics would be unbearable. What the sun does in the hot climates, science can also do in temperate ones. Chemistry has given us many freezing mixtures, but the cost of their production has prevented them from competing with the stored products of Nature.

Where distance prevents the easy conveyance of foreign ice, the old method of storing our native crops will be continued. The ice-house of our country

mansions is a very good refrigerator, but it may be improved. The method of construction is to build a sufficiently capacious vault, and pile a mound of earth on the outside. This would do very well if our climate were dry, but unfortunately the rain saturates it, the trees planted upon it retain the moisture, and the non-conductibility of the structure is thereby very much damaged. A coating of oiled felt, or even of cement, on the outside would remedy this defect, and save many tons of ice to the proprietor.

THE END OF VOL. I.

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